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ABSTRACT

This document lists and annotates commercial and noncommercial resources pertaining to machine-tool technology. Following an introduction that explains how the document came to be written, the subjects of succeeding chapters are (1) periodicals; (2) associations; (3) audiovisual resources, including a subject index; (4) publishers, including a subject index for texts; (5) literature from private corporations, including a table of contents and addresses of the companies; (6) information systems and services; (7) miscellaneous resources, including comprehensive machining resources, selected American National Standards Institute (ANSI) standards, selected military specifications and standards, seminars, and other instruction; (8) resources prepared for the instructor, including periodicals, associations, information systems and services, and hardware; and (9) a selected machine-tool technology noncommercial curriculum resource bibliography. The document concludes with an index keyed to the processes used in machine-tool technology. (CML)

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MACHINE-TOOL TECHNOLOGY INSTRUCTOR'S SOURCEBOOK

Anthony M. Tammer

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A NOTE TO THE READER

This work is not copyrighted; the reader may use it freely. This edition, grants willing, will not be the last; it is a first step towards a more comprehensive work that fills a definite need. If the reader is aware of any inaccuracies in this edition, has comments or criticisms, or is aware of educational literature in the area of machine tool technology that would enhance a second edition, I would appreciate knowing about it. Please write to:

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Arcata, CA 95521

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INTRODUCTION

This work was compiled in 1988-1989, in partial fulfillment of the requirements of a Master of Arts Degree at Humboldt State University, Arcata, California. I have reviewed personally all of the material in chapter 5 "Literature from Private Corporations", while indexes and catalogs have been consulted for the remaining chapters. All bibliographic materials have been confirmed by me prior to inclusion in this work. While not all-inclusive, to the best of my knowledge it is an accurate assesment of most of the available commercial and non-commercial resources in the area of machine-tool technology. Of course a compilation such as this needs continual updating to remain current, as experience has shown me that any technical bibliography which has not been updated within the last ten years is almost worthless.

There are many fine resources that are not included because they are out of print; still they may be found in technical and school libraries. A good example is the Van Keuren Company handbook No. 37, Precision Measuring Tools, one of best introductions to gages and gaging techniques, but which is now, alas, unavailable from Van Keuren.

CHAPTER 1. PERIODICALS

Abrasive Engineering Society Magazine

Abrasive Engineering Society (AES)
1700 Painters Run Road
Pittsburgh, PA 15243
412-221-0909
ISSN 0195-0932
Indexed: Metal Abstracts
Since 1963

Abrasive Engineering Society Magazine, published quarterly, deals with all subjects related to processing with abrasives, both loose and cemented. The periodical includes as regular departments an Advertiser's index; AES Chapters and Meeting Roster; AES Recognizes; AES Responds; AES Salutes; Briefs; Literature; President's Report; Products. Technical articles discuss such advanced subjects as grinding cams with vitrified CBN wheels. The Biennial Buyers Guide is a valuable reference source, listing AES publications, educational programs and activities (see AES under Associations) manufacturers of abrasives and abrasive machines, process related equipment, special purpose abrasives equipment, and grinding services. Technical articles presented in the Buyers Guide constitute an introduction to the various processes, materials and terminology, discussing abrasive bond systems and uses, abrasive grains and hardness measurements, selecting the proper coated abrasive specialty, etc.

American Machinist

"The Magazine of Metalworking Manufacturing"

Penton Publishing Inc.
1100 Superior Ave.
Cleveland, Ohio 44114
212-867-9191

indexed: Applied Science and Technology Index, ISMEC

The American Machinist is a tremendous source of current machining information, and many definitive articles on

traditional and non-traditional machining processes featured in this periodical are cited in various databases and indexes. The publication is divided into Technology Trends, a series of about seven feature articles; Metalworking Business Trends; The Mart, a listing of new equipment, Free Advertising Literature, and what may be important for the instructor, a listing of videos that may be purchased or rented free or at a nominal charge. Other regular departments include an Editorial, Metalworking and the Law, 100 and 50 Years Ago. An annual Buyers Guide is offered as part of a regular monthly issue.

Automatic Machining

Screw Machine Publishing Co.
100 Seneca Ave.
Rochester, NY 14621
716-338-1522
indexed: Science Abstracts
since 1939

Automatic Machining is published monthly. The periodical focuses on automatic screw machines (Swiss, non-Swiss, and multiple spindles) as well as CNC and NC machines. The publication is free of charge to "management, engineering purchasing production and supervisory personnel in qualified U.S. metalworking plants."

Regular monthly features include: Plants and People; Night Shift; Technical Data; Screw Machine News and Developments; Freebies; Fastener Facts; Software News; Date Pad; Welcome Aboard.

Carbide and Tool Journal

Society of Carbide and Tool Engineers
ASM International
Rt. 87, Metals Park, OH 44073
216-338-5151
ISSN 0192-8333
indexed: ISMEC, Metals Abstracts
since 1969

With a circulation of approx. 10,000, Carbide and Tool Journal, published bi-monthly, is the publication of the Society of Carbide and Tool Engineers, who since 1964 have been an affiliated society of ASM International (see Chapter 2). The emphasis is on carbides and other cutting/forming tool materials. Other topics featured include abrasives and

grinding, surface finishing technology, powder metallurgy technology, NC/CNC machining, nontraditional machining processes, testing, inspection, and quality control. There is comparatively little advertising the Journal, which features many technical articles for its approx. 40-page length.

Note: Carbide and Tool Journal is as of 1989 incorporated in the periodical Cutting Tool Engineering.

CNC-WEST

"Dedicated to Improving the Productivity of Western Metal-working"

Arnold Publications Inc.
4111 E. South St. #F, Lakewood, CA 90712
213-634-2321

CNC-West is a bi-monthly publication dedicated to high-tech. manufacturing in the Western U.S. Issues are distributed free of charge to qualified personnel. Each issue contains several articles on a theme, such as CNC controls, CAD/CAM and Software. Regular departments include Exec Hotline (business trends); Industry News; People-in-the-News; Issue Focus; Product Parade; Tooling and Accessories; Quality Assurance; New Literature.

Cutting Tool Engineering

"The Magazine of the Metals and the Materials-Cutting Industry"

CTE Publications Inc.
464 Central Ave.
Northfield, Illinois 60093
312-441-7520
ISSN 0011-4189
indexed: ISMEC, Metal Abstracts, World Aluminum Abstracts
since 1955

Cutting Tool Engineering is published bimonthly, and is circulated free of charge to "qualified operation, management, and supervisory personnel who are concerned with the metal cutting function in the metal working industry. This periodical contains articles dealing with cutting fluids, new sawing processes, high velocity coolant systems, etc. An Annual Buyers Guide is published, with a glossary of terms. Copies of back issues are available on microfilm from:

UMI. (see Chapter 6)

Note: Cutting Tool Engineering as of 1989 incorporates the periodical Carbide and Tool Journal.

Cutting Tool/Machining Digest

ASM International
Metals Park, Ohio 44073

Cutting Tool/Machining Digest is a specialized collection of technical and business-related abstracts related to the field of cutting tool technology. This entry is discussed in detail in Appendix B: Associations, under ASM International.

EDM Digest

"A forum for today's electric discharge machining"

Eagle Publications inc.
424 Nine Mile Road, Ste B
Novi, MI 48050-9846
313-347-3487
ISSN 0199-3550

EDM Digest, published bi-monthly, deals exclusively with electrical discharge machining processes. Emphasis is on new products, processes and applications. The digest is essential for acquainting the reader with what is new in EDM technology. The periodical is free of charge to qualified personnel.

Industrial Machinery News

Hearst Business Media Corp.
29516 Southfield Rd.
P.O. Box 5002
Southfield, MI 48086
313-557-0100
since 1953

IMN is a monthly publication with a circulation of about 70,000. The periodical provides an advertising forum for machine tool distributors. Thousands of machine tools are listed in each issue, new and used. The periodical contains

one or two feature articles per issue. March, 1989 issue discusses the availability of software for the small job shop. A manufacturing software directory is included.

Industrial Models and Patterns

National Association of Pattern Manufacturers
1246 W. 70th St.
Cleveland, Ohio 44102
since 1953

Industrial Models and Patterns deals with the manufacture of patterns, molds, models, and plastic tooling. Running to a length of about 11 pages, the periodical has one feature article, with new products, independent business reports, classified employment advertisements, and a letter from the President comprising the rest of the periodical. Advertisements for products such as foundry tooling and pattern and model shop supplies are found (approx. four advertisements per issue) in the periodical.

Job Shop Technology

"Furnishing the OEM with Innovative Job-Shop Processes and Services."

The Edwards Publishing Company
16 Waterbury Road
Prospect, CT 06712-1215
ISSN 0746-0881

Job Shop Technology is published quarterly, free of charge "to qualified personnel". As its title suggests, it is written from the perspective of the small job shop. Subject matter is not restricted to metals, but most advertising is centered around metal processing. Articles are a curious mixture of basic discussions and sophisticated applications. The regular departments consist of: Industry News; Short Runs; Shaping Briefs; etc. Feature articles might be on lasers, E.D.M., a particular job shop, etc.

Machine and Tool Blue Book

"Manufacturing Technology for Increased Productivity"

Hitchcock Publishing Company
25W550 Geneva Rd.
Wheaton, IL 60188
312-665-1000
ISSN 0024-9106
indexed: Metals Abstracts, Engineering Index
since 1906

Machine and Tool Blue Book is a monthly publication. Regular features include: Focus on Quality; Calendar; Industry outlook; Today's manager; Money Sense; Leading Edge; Field Reports; Newsfronts; Free Literature; Classified. The publication will usually have about six feature articles which cover subjects such as coming exhibitions, case studies on the implementation of new manufacturing systems, articles by leading personnel in the machine-tool industries, etc.

Manufacturing Engineering

Society of Manufacturing Engineers
P.O. Box 930, Dearborn, MI 48121
313-271-1500
ISSN 0361-0853
indexed: Applied Science and Technology Index, ISMEC,
Engineering Index, Metals Abstracts
since 1932

Manufacturing Engineering is published monthly. Emphasis is on new manufacturing processes, quality assurance methods, advances in machining processes, CAD/CAM, etc. Available on microfilm/microfitch from UMI (see Chapter 6) Users registered with the Copy Clearance Center, 21 Congress St. Salem, MA 01970, can purchase photocopies for a fee.

Regular departments include: Quickread, What's New In Brief; Resource Market, literature and AV materials available in the areas of inspection, management, material removal, materials, systems and controls; Calendar; Products and Literature; One More Look, information on advertised products of interest; Opportunities, courses offered, positions open, services provided. Each issue of this periodical contains a number of articles which focus on a specific subject related to manufacturing engineering.

Metalworking Digest

"New Products, Systems, Services"

Gordon Publications Inc.
P.O. Box 1952
Dover, NJ 07801-0952
201-361-9060
ISSN 0026-1009

Metalworking Digest is a glossy, color, newspaper-format periodical issued 11 times per year. The publication is distributed free of charge "to 101,000 qualified readers engaged in metalworking activities in U.S. plants." With no discrete departments, feature articles, or editorials, the periodical is a marketplace for new products, machine tool and accessory suppliers, with advertising in some form filling all available space in its approx. 50 pages per issue.

Metlfax

"New Metalworking Products and Processes"

Thomson Industrial Press
6521 Davis Industrial Parkway
Solon, Ohio, 44139
216-248-1125
since 1956

Metlfax is published 13 times per year. The Editor's Notebook reviews the latest products, services, and developments in the metalworking field. Coming Events, Materials, Cover Story, Contract Contax (for small business services available on a contract basis), Technology Tips, Free Samples, New Metal-removing Tools, Free Lit(erature), and New Components, Accessories, are among the regular features of this periodical, which is dense with advertising.

Modern Application News

"The Metalworking Idea Magazine"

Nelson Publishing
2504 N. Tamiami Trail
Nokomis, Florida 34275
813-966-9521
ISSN 0277-9951
since 1967

Modern Application News (for design and industry) is published bimonthly. The periodical contains articles dealing with CNC controls, coolants/lubricants, industrial finishing, etc. An "Annual Cutting Tool Directory" is offered.

Modern Machine Shop

Gardner Publications Inc.
6600 Clough Pike
Cincinnati, Ohio 45244-4090
513-231-8020
ISSN 0026-8003
since 1928

Modern Machine Shop is published monthly with two issues in January. The periodical is "free of charge to selected production, engineering and management personnel employed in manufacturing plants where metalworking operations are performed." Articles deal with such topics as modular fixturing, CAD/CAM, coolants, etc. Extensive advertising informs the reader about what is new in the field. Gardner Publications also offers an annual "NC/CIM Guide-book". Libraries and other organizations registered with Copyright Clearance Center, 21 Congress St. Salem, MA 01970 may photocopy any article for a flat fee per article.

Projects in Metal

The Home Shop Machinist, Inc.
P.O. Box 1810
Traverse City, Michigan 49685
800-447-7367
ISSN 0897-070X

Published bimonthly, each issue of Projects in Metal gives an illustrated exposition of about six projects that may be undertaken by the hobby-shop machinist. Typical projects include the construction of a lathe collet chuck (for 5-C collets); making brass hammers; construction of a mill/lathe grinder; and machining an expanding mandrel. Some of these projects may be ideal for the school shop. The periodical has no editorial, regular departments, or advertising.

The Home Shop Machinist

"Dedicated to Precision Metalworking"

The Home Shop Machinist, Inc.
P.O. Box 1810, Traverse City
Michigan 49685
800-447-7367
ISSN 0744-66440

The Home Shop Machinist is for readers who do machining as a hobby, with fairly small equipment. Many of the articles in the periodical are of a "how to make do without" nature. Since many fine machine tool craftsmen in this country are retired and machine for a hobby, it is not surprising to find sophisticated projects as feature articles. Some of the regular departments: From the Editor; Reader's Forum; Q @ A; Chips and Sparks; The Micro Machinist; The Apprentice; Machinist's Marketplace. Typical feature articles are on subjects such as the construction of a small melt furnace; the Minton milling machine; Patterns and Molding Procedure, one-evening projects.

Tooling and Production

"The Manufacturing Magazine"

International Thomson Industrial Press
6521 Davis Industrial Parkway
Solon, Ohio, 44139
216-248-1125
ISSN 0040-9243

Tooling and Production is a monthly publication whose contents include the following departments: Presstime Notes; Manufacturing Update; Technology Update; Manufacturing in Action; Computer Hardware and Software; Product News; Video Reviews; Coming Events; Speaking Out. Feature articles are typically concerned with advanced manufacturing technology, new material cutting systems (laser, etc.).

CHAPTER 2. ASSOCIATIONS

Abrasive Engineering Society
118 Main Street P.O. Box 461
Connoquenessing, PA 16027
412-789-9141

The Abrasive Engineering Society (AES) is concerned with disseminating information about abrasive materials and machine-tools utilizing abrasive processes; to this end AES conducts regional seminars and annual conferences to promote exchange of information. AES publishes Abrasive Society Engineering Magazine (see Chapter 1), as well as conference proceedings, technical books, a membership newsletter, literature and training materials.

The Membership Newsletter lists abstracts of papers presented at AES conferences. A book of compiled papers is offered for sale by AES. Listed below are some of the papers presented at the 1988 Annual Conference:

"High Strength Super Abrasive Boron Filaments for Cut-Off Wheels"

"Recent Advances in Coated Abrasive Structure"

"Diamond Profiling Systems"

"Justifying Creep-Feed Grinding"

"Surface Finishing of Stainless Steel Flat Coil"

"Tool and Cutter Grinding with Borazon CBN"

Speakers at AES Annual Conferences are from leading industries in the field.

The AES periodical Reference and Buyers Guide lists publications available from AES. The 1986-1987 Buyer's Guide lists 18 booklets on grinding safety; Grinding Wheel Storage; Cutting-Off Wheels; Information On Abrasive Machining; Portable Grinding Machines, etc. Included in this list are 25 publications ranging in price from \$3.00 to \$15.00 (1987). on various grinding subjects. The AES proceedings for 1982

and later are available, and lastly, several books are offered for sale (these are not published by AES) on abrasives methods engineering. Some of these works are published by the Grinding Wheel Institute (see under Associations).

For information on grinding technology, the AES "Bookshelf" is a good start.

The Aluminum Association Inc.
900 19th Street, N.W.
Suite 300
Washington, D.C. 20006

The Aluminum Association represents the aluminum industry of the U.S. It was founded in 1933, and is a "prime source for information about aluminum and its processing." The association publishes books, holds conferences, provides technical information services, including a data base "World Aluminum Abstracts", which may be accessed on-line through DIALOG file 33.

The Aluminum Association offers the 48-page booklet Publications and Audiovisual Guide free of charge. Listed in this guide are the general publications of the association, industry statistics, technical information services, etc. Of particular interest from a material removal point of view:

Forming and Machining Aluminum 1988

Cold Finished Aluminum Alloys for Automatic Screw Machines
1984

American Society for Metals
(ASM International)
Metals Park, Ohio 44073
216-338-5151

ASM International, a not-for-profit organization, provides materials information publications, offers abstracting services, and sponsors conventions, often jointly with other organizations. One of the publications of ASM is Metals Abstracts, which deals with all aspects of metallurgy. A separate Metals Abstracts Index and a Thesaurus of Metallurgical Terms are aids to doing research in Metals Abstracts. Metals Abstracts is divided into ten "digests", which may be purchased individually. The digest that is of interest to this study is Cutting Tool/Machining Digest, which is a monthly publication of abstracts with some 150 or

so entries per month, divided into two departments: cutting tool technology and machining. Each abstract is about 200 words in length. Sources for the digest are derived from journals, books and conference papers published worldwide. Complete copies of most articles cited may be obtained from the Materials Information Photocopy Services provided by ASM.

ASM also has 129 published searches (compilations of abstracts pertaining to a single subject) available. A few of these are related to machining:

Tool Life in Machining Cast Iron 1966-1988

Tool Life in Machining Steels 1966-1982

" " " " " 1983-1987

" " " " " 1988-1989

Tool Life in Machining Non-Ferrous Alloys 1966-1989

Lubricants/ Coolants in Metalworking and Machining 1984-1985

" " " " " " 1986-1987

" " " " " " 1988-1989

Machining Ceramic Materials 1986-1988

Other publications of interest listed in the 1989 ASM Book Catalog include:

Tool Materials for High-Speed Machining 1987 137 pp.
Proceedings of a 1987 conference sponsored by Society of Carbide and Tool Engineers.

Machining Source Book 1988 488 pp. A collection of outstanding articles from the technical literature.

ASM provides many other information services, which are described in their Materials Information Catalog. Among them are the Metadex database, a translation service, a world calendar of events, etc. Metadex is accessed through DIALOG file 32. An affiliated society of ASM is the Society of Carbide and Tool Engineers, which publishes the Carbide and Tool Journal (see Periodicals).

The Materials Engineering Institute of ASM offers 27 home study courses as well as seminars given at Metals Park, OHIO. ASM in agreement with JOBNET provides a professional engineering employment registry, which is a nationwide computerized employment service.

Association for Integrated Manufacturing Technology
AIMTECH
(Formerly the Numerical Control Society)
5411 East State Street
Rockford, IL 61108-2378
815-399-8700

AIMTECH specializes in information services related to NC, DNC, CAD/CAM, CIM, and integrated manufacturing technologies. AIMTECH is affiliated with the Fabricators and Manufacturers Association International. The purpose of AIMTECH is to "promote the advancement, application integration and communication of manufacturing technologies by fostering a professional and educational environment within the manufacturing industry." Membership benefits involve participation in technical conferences, workshop and training programs, subscriptions to the above periodicals, access to the book and publication library, etc.

The periodical IM Report is the official publication of AIMTECH (ISSN 0886-1463). Typically running to a length of about ten pages, the subject content of this monthly publication deals with all aspects of CIM. AIMTECH also published a monthly newsletter AIMTECH REPORT.

The current (1989) AIMTECH List of Publications includes 2 CAM publications; 24 Annual Meeting and Technical Reports (1964-1988); 11 NC Publications (not all of which are published by AIMTECH).

The Copper Development Association Inc.
P.O. Box 1840
Greenwich, CT 06836
203-625-8210

The Copper Development Association is a trade organization whose purpose is to promote the development of copper-based metals. The association publishes a series of design handbooks, materials selection and design guides, products handbooks, standards handbooks, applications bulletins, architectural sample sets, application data, technical reports, periodicals and statistics, all having to do with copper-based alloys. Three publications deal with the machining of these alloys:

Machining Rod Handbook (Copper, Brass and Bronze). This 31-pp. booklet offers several paragraphs each on the following subjects: machining speeds, tool wear, finish and accuracy, power required, turning with single point tools, form turning, milling, drilling, boring, threading and tapping,

sawing, coolant-lubricants, cleaning and coloring. Also discussed are secondary operations: knurling, thread rolling, roll lettering, spinning and bending.

Free-Cutting Brass for Lower Screw Machine Product Cost

This is comprised of a series of six data sheets (case histories of screw machine products which have been converted from leaded free-machining steel to free-cutting brass, copper alloy no. C36000). Each data sheet is one page in length and is free of charge.

Free Machining Brass Pays Off in the Long Run. This is a 3-page reprint of 1980 Tooling and Production article, a case history showing the advantages of using C36000 free-machining brass.

Brass Screw Machine Parts Cost Less Than Steel. A value analysis of two case histories based upon ASTM test results, demonstrating the cost savings of free-machining brass over leaded steel.

Grinding Wheel Institute

30200 Detroit Road
Cleveland, OH 44145-1967
216-899-0010

Grinding Wheel Institute is organized for the development of efficient and safe grinding practices. The institute has been responsible for the development of ANSI Standards B7.1-1988: safety requirements for the use, care and protection of abrasive wheels; B74.213-1982: standardization of the shapes and sizes of grinding wheels and mounted wheels; B74.13-1982: standard markings for identifying grinding wheels; B74.21-1986: standardized fatigue proof test procedure for vitrified grinding wheels.

Grinding Wheel Institute offers numerous publications for fairly nominal prices, as shown on their one-page list of publications. Many of these publications are booklets, and may also be purchased from Abrasive Engineering Society (see Associations). Larger works include:

The Grinding Wheel (textbook) 1978;

Cost Reduction Principles in Grinding.

Six audiovisuals are available in various formats, including VHS. The titles of four of these offerings are cryptic; contact Grinding Wheel Institute for further

information. "Common Sense and Cutting-off Wheels", and "Tools That Shaped America" comprise the remaining two.

National Tooling and Machining Association
9300 Livingston Road
Ft. Washington, MD 20744
(301) 248-6200

One of the purposes of this organization is to develop new training materials in the metal-working industry. The NTMA is "dedicated to training persons for careers in the metalworking industry".

The NMTA offers a series of 320 small training modules which can be grouped together for specific course configurations, applicable to high schools, industrial/vocational centers, community/technical colleges, business/industry apprentice and upgrade training. Customizing can be provided by NMTA or modules may be configured by purchaser.

The NMTA operates eleven regional training centers to teach skill development and related theory courses to apprentices, adult retraining, and pre-apprentice training.

Other services provided include: Entry Employee Testing Service; Government Affairs Services; Government Contracting Services; Answer Desk; Apprentice Registration (related to starting an apprentice program in-plant).

The NMTA Publications and Training Materials catalog is available free of charge upon request. Listed below are those items published by NMTA.

Basic Shop Theory-All You Need To Know about Tools and Processes Hardman, 254pp. Instructor's guide is available.

How to Read Shop Prints and Drawings
Hardman 228pp. plus prints. Instructor's guide and overhead projection transparencies are available.

Measuring and Gaging in the Machine Shop 178pp.

Practical Mathematics for Metalworking Trainees
Hardman 272pp. Instructor's guide is available.

Introduction to Geometric Dimensioning and Tolerancing
Foster 248pp.

Modern Geometric Dimensioning and Tolerancing with Workbook Section Foster 222pp. Instructor's guide and overhead projection transparencies are available.

Basic Jig and Fixture Making for Metalworking Trainees Harig 149pp. Instructor's guide and overhead transparencies available.

Moldmaking and Die Cast Dies for Metalworking Trainees Kluz 306pp. Instructor's guide is available.

Doing Things Right: Managing Quality in the Small Tooling and Machining Company Ruxton 249pp. Study guide and six videocassettes are available. Overhead transparencies may be ordered separately.

The NTMA offers a selection of audio visual materials, as listed in the guide:

"Single Point Cutting Tools" geometry, grinding, terminology

"The Twist Drill" basic concept of drilling

"Milling Cutters" principles, types of cutters

"Thread Cutting" principles and terminology

"Secondary Cutting" reaming, broaching, spotfacing, etc.

"Mathematics for Machinists" a basic course

"The Toolmaker's Art" career opportunities

"Doing Things Right" managing quality in the small tooling and machining company.

Running time for the videocassetes listed above is not given.

NMTBA "The Association for Manufacturing Technology"
(formerly National Machine Tool Builders Association)
7901 Westpark Drive
McLean, VA 22102-4269
703-893-2900

The NMTBA, a trade association of machine tool manufacturers, publishes an annual Directory of U.S. Machine Tool Manufacturers. This is a cross-referenced directory of all NMTBA members along with the types of machines they build, and is free of charge.

The NMTBA offers the following publications, as listed in their publications catalog:

machine tool operator training textbooks:

Blueprint Reading

Basic Shop Measurement

Shop Theory

Shop Math

technical publications:

Guidelines for the Measurement of Machine Tool Utilization

Noise Measurement Techniques

Definition and Evaluation of Accuracy and Repeatability of

NC Machine Tools

Common Words As They Relate to NC Software

NC Character Code Cross Reference Chart

correlating the codes and standards needed to generate tapes for NC machine tools

Machine Tool Standards Index

a bibliography of standards pertinent to the design, manufacture, sale and use of machine tools.

Selecting an Appropriate NC Programming Method

NC is EZ (an NC primer)

NC Part Programming and Summary Report

Bibliography of NC standards and Related Publications

Guidelines for Quality Systems in Machine Tools and Related Systems.

NMTBA also offers for sale four conference proceedings, including the proceedings of the Fourth Biennial International Machine Tool Technology Conference (Sept. 7 through 14 1988). This is an important source of current information on 36 machine-tool processes including:

CAM; Precision Machining Operations; Lasers in Manufacturing; High Speed Grinding; Non-Conventional Machining; Precision

Metrology; Tooling Today's Machines; Flexible Machining Systems; Metal Cutting Technologies; New Cutting Tool Techniques; Waterjet Machining; Modern Gear Making Methods.

NMTBA offers an "Information Resource Center" drawing information from an in-house database. For a price quote on technical reports to customer specifications, call 800-544-3597. Some of the technical reports (published searches) available from NMTBA's "info bank" include:

TR-0015-1988 Quality and Manufacturing
over 400 citations on quality relating to the machine tool industry.

TR-0014-1988 Federal Laboratory and Technology Resources
Government laboratories, services and facilities able to offer technological assistance.

TR-0010-1987 Computer Integrated Manufacturing

TR-0009-1987 NC/CNC Grinding Technology

TR-0008-1987 Statistical Process Control

TR-0007-1987 Ergonomics and Human Factors

TR-0006-1987 Manufacturing Systems and Cells

TR-0002-1986 Laser Technology

Tr-0001-1986 Expert Systems

Conferences sponsored by NMTBA include three regional manufacturing technology shows. The Western Show 1989 was in Anaheim (Sept.26-28). Phone 703-827-5277 for information. NMTBA is sponsoring IMTS 90: The World of Manufacturing Technology. September 5-13, 1990 Chicago, IL.

Chapter 3 of this work lists audio visual materials offered by NMTBA

For prices and ordering information contact:
Publications Order Clerk
NMTBA-The Association for Manufacturing Technology
7901 Westpark Drive,
McLean, VA 22102-4269
703-827-5261

Metcut Research Associates
11240 Cornell Park Drive
Cincinnati, Ohio 45242-1812
513-489-6688

Metcut Research Associates is concerned primarily with information related to material removal processes. Metcut runs a machining technology laboratory where research is conducted on the machinability of materials. The laboratory is also used to provide customer assistance with questions relating to machining parameters such as tool life, machinability comparisons, optimization of machining parameters, tool force measurement, and evaluation of emerging machining technologies.

Metcut provides CIM services, as well as their own CIM software. The Metcut CIM package, "MetCAPP" is an integrated software system directed towards material removal manufacturing.

Metcut Research Associates runs a Machinability Data Center (MDC), established in 1964, which offers "industry-wide information on manufacturing processes and CIM technologies." MDC includes a reference database (in-house); inquiry services, such as preparing customized answers to machining problems; training, through video courses and seminars, (a two-day seminar is offered approx. bi-monthly at the Ohio center.- see Chapter 7) and publications such as the Machining Data Handbook (see Chapter 7) and Machining Briefs newsletter.

Although much software exists for programming machine tools, estimating machining costs, integrating manufacturing functions, Metcut Research Associate's "CUTDATA" is one of the few programs which deals with such variables of the machining process as speeds and feeds, tool geometries, cutting fluids, etc. The information for this program parallels that of the Machining Data Handbook. Auxiliary functions such as calculating material removal rates, cutting time per pass, horsepower requirements, etc., are included.

"CUTDATA" is the first module of Metcut Research Associates process planning software, "METCAPP". Other modules consist of "CUTTECH", which deals with machine operation planning details, "CUTPLAN", which is a planning document preparation system for storing and merging several "CUTTECH" sessions. Still under development (1989) is "CUTSPEC", which manages customer's machining test results and reducing them to "CUTDATA/CUTTECH" recommendations. "CUTDATA" is compatible with the IBM PC, while the other METCAPP modules must be used with larger computers such as the DEC and Apollo systems.

Photo Chemical Machining Institute
4113 Barbary Drive
Lafayette Hill, PA 19444
215-825-2506

The photo chemical machining institute is devoted to the dissemination of information concerning the processes of photo chemical machining, and lists over 125 major companies in the U.S, Europe and Asia as its members. The institute publishes the quarterly PCMI Journal, which solicits articles on state-of-the-art processes from its members, and announces conferences and other activities the institute sponsors. At this time PCMI is in the process of setting up a database retrieval system.

The Photo Chemical Institute publishes the following brochures which are available individually or as a complete set at a somewhat reduced price. A discount is available to schools.

#10 Photo Chemical Machining....Metal Parts Without Stamping Dies.

G-100 Basic Principles of Photo Chemical Machining
Membership Directory

#210 Master Artwork Design for Photo Chemical Machining

#510 Photo Resist in Photo Chemical Machining

P-610 The Do's and Don't of Photo Chemical Machining

#1000 What is Photo Chemical Machining and What Can It Do For You?

#1025 An Introduction to Photo Chemical Machining

H-1050 Design and Artwork Generation Handbook

#2000 A Showcase of Applications

#2050 OSHA Hazard Communication Management Program

#2060 Employee's Training Program

Society of Manufacturing Engineers
One SME Drive, P.O. Box 930
Dearborn, Michigan 48121-0930

SME publishes and distributes books, the periodical Manufacturing Engineering (see periodicals) the quarterlies Journal of Manufacturing Systems and Technical Digest, software and videotapes. In addition, a data base service is offered and expositions (seminars) are sponsored.

One of the important services of SME is the publication of approximately 800 "Technical Papers" annually. Many of these publications are recent conference papers, and thus represent very up-to-date information on industrial processes. Technical Digest is a quarterly listing of new technical papers published by SME. The contents of Technical Digest are available on-line through SME's INTIME data base (see Chapter 6).

SME's annual publications catalog lists all publications, software, videotapes and services offered during the year. Some books in the catalog are not published by SME, but are offered for sale by the society. For a complete listing order a complimentary copy. Listed below are relevant works published by SME:

Tool and Manufacturing Engineers Handbook (see Chapter 7)

Tool Engineering:

Workholding 630 pp. 1982 soft cover.

Troubleshooting Manufacturing Processes 500 pp. 1988
hard cover.

Jigs and Fixtures 2nd ed. 440 pp., 1982 hard cover.

Low Cost Jigs, Fixtures and Gages for Limited Production
320 pp. 1985 hard cover.

Fundamentals of Tool Design 720 pp. 1984 hard cover.

Material Removal:

EDM; Tooling, Methods and Applications 230 pp. 1983
Editor: E.C. Jameson.

Industrial Lasers 523 pp., 1986 soft cover.

Cutting Fluids and Lubricants 350 pp., 1985 soft cover.

Nontraditional Machining Processes 2nd ed. 255 pp., 1983 soft cover.

Grinding: Theory, Techniques and Troubleshooting 230 pp., 1983 soft cover.

Machining Hard Materials 250 pp., 1982 soft cover.

Manufacturing Engineering Explores Grinding Technology selected articles from "Manufacturing Engineering" 200 pp., 1982 soft cover.

Modern Trends in Cutting Tools 300 pp., 1982 hard cover.

Improving Production with Coolants and Lubricants 240 pp. 1982 hard cover.

Machining Fundamentals Follette 300 pp., 1980 soft cover.

Milling: Methods and Machines 250 pp., 1980 hard cover.

Finishing/Deburring:

Robotic Deburring Handbook Gillespie 130 pp, 1987 soft cover.

Deburring Technology for Improved Manufacturing Gillespie 630 pp., 1981 hard cover.

CAD/CAM, NC

New Directions Through CAD/CAM Beeby, Colier 230 pp., 1986 hard cover.

Numerical Control, Fundamentals 242 pp., 1980 hard cover.

Numerical Control, Applications 252 pp., 1980 hard cover.

CHAPTER 3. AUDIO VISUAL RESOURCES

Listed in this section are audio visual aids, mostly in the form of VHS format videocassettes (abbreviated to "videos" throughout the text), offered by the largest producers of AV materials in the area of technical/vocational education, as well as by private industry. The prices of these materials are continually increasing, and have not been included in this work; the reader should be warned that they vary in the extreme. Information concerning preview or leasing services has been included where applicable. Some producers do not state the run time for each video. Each producer/distributor has been numbered in order of appearance in this chapter.

At the end of the chapter, on page 44, there is a numerically-coded (in order of appearance) subject index for the reader's convenience.

Although there are many indexes to AV materials in the reference section of university libraries, the index most relevant for our purposes is:

Vocational and Technical Audiovisuals

National Information Center for Educational Media (NICEM)
Access Innovations, Inc.
P.O. Box 40130
Albuquerque, NM 87196
505-265-3591

The titles in this index are selected from Library of Congress holdings as well as reviews of publications catalogs from various producers/distributors. The Vocational and Technical Audiovisual index is a valuable tool in that short descriptions of each video are provided. NICEM indexes are not all-inclusive, however, and this volume is becoming increasingly dated, as it was last compiled in 1985-6. NICEM indexes are available in print, magnetic tape, CDROM, or on-line via DIALOG: file 46 (see Information Systems).

Manufacturing concerns are increasingly using videos to demonstrate their products and processes. The educational value of these videos is hard to ascertain without viewing them. The American Machinist (see Periodicals) now has a

fairly regular department "New Videos". Listed in this chapter are relevant videos cited in that periodical.

(1)

AMCEE

Association for Media-Based
Continuing Education for Engineers
430 Tenth St. N.W.
Suite S-208
Atlanta, GA 30318-5755
1-800-338-9344

AMCEE produces a large number of training programs in video format. These programs are produced in conjunction with "33 leading universities." The 1987/88 Catalog lists the following programs of interest:

Modern Manufacturing Production Systems

34 hours on 34 color videos. Rental agreement four weeks (not available for purchase). Produced in conjunction with Auburn University.

Planning for Computer-Integrated Management

43 hours on 43 color videos. Produced in association with Arizona State University.

Industrial Robotic Design

40 hours on 50 color videos. Produced in conjunction with University of Massachusetts.

Industrial Robotics in Manufacturing

35 hours on 28 color videos. Produced in conjunction with North Carolina State University.

Introduction to CAD/CAM

40 Hours on 40 color videos. Produced in conjunction with University of Massachusetts.

Numerical Control -- An Introduction

6 hours on 12 color videos. Produced in conjunction with University of Wisconsin.

Computer Numerical Control

9 color videos. Produced in conjunction with University of Illinois at Urbana-Champaign.

Metal Casting Technology for Casting Users

6 hours on 6 color videos. Produced in conjunction with North Carolina State University.

Principles of Machining

12 hours on 12 color videos. Produced in conjunction

with American Society for Metals. The instructor, Robert Shumway, is coordinator of seminars at MDC of Metcut Research Associates (see Chapter 2).

(2)

Bergwall Productions, Inc.
P.O. Box 238
Garden City, NY 11530-0238
1-800-645-1737

Bergwall Productions Inc. allows review of materials for a fifteen-day period free of charge. Bergwall lists the following titles in their 1989 "Video Catalog" available on request (The following titles are filmstrips transferred to VHS format):

Factory of the Future

FMS/CIM Explained 16:28 min.
Factory Control Systems 14:32 min.
A Prototype Factory 11:14 min
Building a Classroom Factory 14:48 min.

Robots: Selection and Installation

Robotic Design 14:10 min.
Principles of Selection 14:26 min.
Assembling a Robot 15.27 min.
Installing and Programming 12.32 min.

Exploring Technology

Historical Evolution 20:00

Manufacturing Systems Explained

Inputs and Resources 1
Inputs and Resources 2
Processes of manufacturing
Controls and Outputs

The above listings give an idea of the scope of Bergwall's offerings. Also included in the catalog:

Autocad explained: 8 videos

Autocad: An Introduction: 4 videos

Autocad: Electronic Drafting: 4 videos

Autocad: Mechanical Drafting: 4 videos

CAD Computer Aided Drafting: 6 videos

Metal Shop Safety: 4 videos
NC Explained: Two-Axis Milling Machine 4 videos
The Lathe Explained: 6 videos
Lathe Cutting Tools Explained: 3 videos
Three Axis CNC Milling: 4 videos
CNC Vertical Mill: Three Axis: 5 videos
CNC Lathe: Two Axis: 6 videos
Measuring Tools Explained: 6 videos
Milling Machine Explained: 6 videos
The Vertical Milling Machine Explained: 6 videos
Bench Metalwork: 7 videos
Shop Math: 3 videos
Sheet Metalwork: 7 videos
The Horizontal Surface Grinder: 4 videos

(3)

Career Aids
20417 Nordhoff St. Dept. M G 4 5
Chatsworth, CA 91311
818-341-2535

Career Aids, a division of Opportunities for Learning, Inc., allows a 30-day preview of their videos-from-filmstrips only, for up to two items. The following video-from-film-strip items are listed in their catalog "Video Learning":

Introduction to the Metal Shop
How to Operate the Foundry
How to Operate the Shaper
How to Operate the Vertical Milling Machine
Bench Metal Work
Metal Spinning
The Engine Lathe
The Engine Lathe, Part II
Metal Shop Safety

(4)

Cincinnati Milacron
4701 Marburg Avenue
Cincinnati, OH 45209
Attn: Eldine Schramm
Advertising @ Product Promotion
Department 51B

Cincinnati Milacron offers a series of AV materials in either 16 mm film, 3/4 or VHS formats, available for loan free of charge. A five-page catalog (without title) may be obtained listing these materials. Films depict different members of the Cincinnati Milacron product lines. Below are some of their offerings:

CNC Turning Centers: twelve films ranging from 5 to 18 min. With the exception of one research film, these are product sales films.

Horizontal and Vertical CNC Machining Centers: ten product sales films from 6 to 15 min.

CNC Profilers/Specials/Composites Machinery: 5 product sales films, from six to 12 min.

Grinding Machines: 6 product sales films of 10-20 min. and one 20-min. film intended to show the owners of TWIN-GRIP centerless grinders how to properly change wheels.

Systems: These are all product sales films.

Flexible Manufacturing Systems; 14 min.
Milacron Sales @ Systems; 15 min.
Mt. Orab FMS; Mt. Orab case study; 15 min.
Flexible Manufacturing Cell (Cooper Cell); 8 min.
Factory Automation; various forms of factory automation; 12 min.

Robots:

The Road To Success; one of Milacron's robot lines; 13 min.

(5)

DCA Educational Products Inc.
Kellers Church Road
P.O. Box 338
Bedminster, PA 18910

DCA allows previews of their materials up to 15 days exclusive of delivery time. The following are filmstrips

available with audiocassette:

- Lathe Turning With a Three and Four Jaw Chuck
- Drilling and Reaming
- Boring
- Cutting an External V-Thread
- Lathe Turning Between Centers
- Speeds, Feeds and Knurling

The following are available as filmstrips with cassettes, or VHS videocassettes:

- Introduction to the Metal Shop
- How to Operate The Shaper
- How to Operate the Vertical Milling Machine
- Bench Metal Work
- Metal Spinning
- The Engine Lathe, Part I
- The Engine Lathe, Part II
- Metal Shop Safety

Transparencies are available on the following subjects:
Bases of Measurement; micrometers and Vernier Gages; Plug, Ring and Snap Gages; Test Indicators; Gage Blocks; Pipe Thread Taper Gages; Dial Indicators; Roundness Measurement; Pneumatic Gaging; Fixed VS. Pneumatic Gages; Tolerances, Limits and Allowances.

The following are available in VHS videocassette format only:

Measurement: 4 videos, 15 to 19 min.

Layout: One video, 12 min.

Bandsaw: 3 videos, 18 to 25 min.

Engine Lathe: 15 videos, 13 to 40 min.

Drill Press, Radial Drill: 4 videos, 16 to 26 min.

Pipe Threading: 2 videos, 10 to 13 min.

Surface Grinder: one video, 33 min.

Milling Machine: 13 videos, 16 to 53 min.

CNC Machine Operations: 31 videos, 6 to 30 min.

(6)

Gardner Publications Inc.
6600 Clough Pike
Cincinnati, Ohio 45244
513-231-8020

Gardner Publications produces the following "series of practical 'how to' videotapes for CNC users. Each videotape includes documented support material".

CNC Fundamentals - Where To Begin
Coordinate Axes - The Key to Understanding NC
Operating the NC Machine - Getting Off to a Good Start
CNC Programming - Instructions for Successful Machining

(7)

Gulf Publishing Co.
Book Publishing Division
3301 Allen Parkway
P.O. Box 2608
Houston TX 77252-2608
713-529-4301

Gulf Publishing produces a 17-min. videocassette "Machine Shop Safety", which demonstrates the safe use of common machine tools.

(8)

Leighton @ Kidd Limited
295 Evans Avenue
Box 940, Station U.
Toronto, Ontario
Canada M8Z 5P9
1-800-668-6064

Leighton and Kidd allow previewing of videotapes for a charge of \$25.00 (1989). Material may be retained up to 14 days. L and K's catalog "International Videotraining" lists the following videos of interest:

Blueprint Reading for Machinists: six 15-minute videos

Basic Machine Technology: fifty-six 15-minute videos in 4 modules: engine lathe; basic machine technology; intermediate engine lathe; milling and tool sharpening

Machine Shop Basics: 21 videos from 15 to 20 minutes arranged in 3 modules: Basic Shop Math (5 videos);

Machine Shop Fundamentals (8 videos); Machine Shop
Fundamentals Part II (8 videos)

NC/CNC Machine Tools: 20 tapes, from 14 to 19 minutes each
Fundamentals: 12 videos

Advanced Programming: 8 videos

Leighton and Kidd also produce, in the field of quality assurance, a 1-hour videotape dealing with measurement and calibration.

(9)
L.S. Starrett Co.
Athol, Mass. 01331

Starrett produces an audio-visual dealing with the tools and rules for precision measuring, available in VHS or 16mm format. Running time is 38 minutes. The film is available free of charge on a short-term loan basis, or may be purchased for a nominal amount. Write to Starrett on company or school letterhead stationary.

(10)
Meridian Education Corp.
236 E. Front St.
Bloomington, IL 61701

Meridian Education Corp. offers a fifteen-day examination free of charge. Selected videos produced by Meridian include:

Robotics

- Robots in Industry
- Robot Sub-Systems
- Operating Parameters of Robots
- Applications of Robot Technology
- Implementation of Robots
- Human Factors in Robotics
- Fundamentals of Industrial Robots

CAD/CAM Technology

- Introduction to CAD
- Contemporary CAD Technology
- Constructing a CAD Drawing
- CAD Editing Functions
- Modern CAD Systems
- Contemporary CAM Technology

Engineering Drawing Videos

- Intro. to Drafting Tools and Equipment (part I and II)
- Basic Graphic Principles
- Multiview Drawings
- Dimensioning
- Section Views

Blueprint Symbology 12 filmstrip modules. of interest:
Dimensioning
Geometric Dimensioning

Safety in the Metal Shop

(11)

NMTBA (see Chapter 2)

The following materials may be purchased in 1/2" VHS. Rental films (5 day rental period) are available in 16 mm format only.

- Safeguarding of Machine Tools 18 min.
- Safety in Metal Turning Operations 17 min.
- Safety in Drilling, Milling and Boring Machines 17 min.
- The Turning Wheel ... Safety in Grinding Operations 16 min.
- Presses, Production and Protection 13 min.
- Safety Considerations in Die Design 14 min.
- Cutting, Bending and Teamwork 18 min.

NMTBA has received approximately 140 audiovisual materials (1990) from its member companies, and offers these materials for loan or sale, depending upon the company. The formats may include Super 8 video, 16mm, or VHS. These materials may be promotional, educational, or service/repair oriented. For a complete listing of these materials ask for "Available Audio/Video Materials from NMTBA Member Companies".

(12)

National Audiovisual Center
8700 Edgeworth Drive
Capitol Heights, Maryland 20743-3701

The National Audiovisual Center is a federal government sponsored organization which publishes the "Media Resource Catalog", an index of "more than 8,000 federally produced audiovisual programs". The center distributes AV materials through sales (all of the materials in the catalog are for sale), rentals (many 16mm films) and previews of some 16mm films. The catalog is available free of charge.

Other service the Center provides: customer service responds to enquiries concerning federal AV materials; maintains a master file of all AV materials produced by the U.S. Government. To request services contact:

National Audiovisual Center
National Archives and Records Administration
Customer Services Section PY
8700 Edgeworth Drive
Capitol Heights, MD 20743-3701
301-763-1896

Many of the machining AV materials are quite old. Some were produced for the war (WWII) effort and are in black and white. It appears countless hours have been spent making videocassettes in 1/2, 3/4, Beta and VHS formats of these materials. To cite a typical entry in more detail:

Facing, Turning, Boring, Grooving, and Chamfering
30 Min. 16 mm film. Black and White 1942
other formats: 3/4 video, Beta 2 video, VHS video
price: \$110.00

Listings of interest in the catalog include:

History

Industrial Revolution
Coke Making in the Beehive Oven
Saugus Iron Works

Industrial Arts

Boring Machines
Face Milling with a Fixture
Facing, Turning, Boring, Grooving, Chamfering
Rough - Facing, Boring and Turning a Shoulder
Rough - Facing, Turning and Drilling
Setup for Face Milling with a Fixture
Setup for Rough Line Boring
Broaching Machines
Broaching and Internal Keyway
Double Ram Vertical Surface Broaching
Single Ram Vertical Surface Broaching
Drill Presses
Countersinking, Counterboring, Spotfacing
The Drill Press
Drilling a Hole in a Pin
Drilling and Tapping Cast Steel
Drilling to a Layout and Spotfacing Cast Iron
Drilling, Boring and Reaming Work Held in Chuck

The Center's holdings also include:

Grinding Machines: 23 Titles

Hobbing Machines: 5 Titles

Lathes: 26 Titles

Milling Machines: 20 Titles

Technical Measurement: 10 titles (two in Spanish)

(13)

National Tooling and Machining Association
(see Associations)

The following audiovisual materials are offered by the NTMA in either 35mm or VHS format: (lengths of each item are not stated in the catalog)

- Single Point Cutting Tools
- The Twist Drill
- Milling Cutters
- Thread Cutting
- Secondary Cutting
- Mathematics for the Machinist
- The Toolmaker's Art
- Doing Things Right (six videocassettes)

Overhead Transparencies exist for the following subjects:
(these transparencies are related to texts offered in the NTMA Catalog)

- Advanced Diemaking
- Basic Diemaking
- Basic Jig and Fixture Making
- How to Read Shop Prints and Drawings
- Modern Geometric Dimensioning and Tolerancing

Other miscellaneous items offered by NTMA include:
Harig Speed and Feed Calculator
Training Project Prints (69 prints, 39 shop projects)

RMI Media Productions
2807 West 47th St.
Shawnee Mission, KS 66205
1-800-821-5480

RMI's 87-page complimentary catalog lists hundreds of video cassettes in 42 subject areas. Of interest are:

CAD/CAM Technology

- Introduction to CAD
- Contemporary CAD Technology
- Constructing a CAD Drawing
- CAD Editing Functions
- Modern CAD Systems
- Overview of CAM; CAD/CAM Implementation

Robotics

- Robots in Industry
- Robot Sub-Systems
- Operating Parameters of Robots
- Applications of Robot Technology
- Implementation of Robots
- Human Factors in Robotics

Machine Shop

RMI offers 22 videocassettes on the subject of CNC, some dealing with specific MCU's: MAKINO, OKUMA

Measurement

- Use and Care of the Micrometer
- How to Read a Metric Micrometer
- How to Read a Vernier Caliper
- Geometric Form and Positional Tolerancing

Layout

- Basic Layout Procedures
- Layout #1 Hole Location
- Layout #2 Contours and Angles
- Layout #3 Surface Plate

Bandsaw

- Safety, Familiarization on Horiz. Bandsaw
- Safety, Familiarization on Vert Bandsaw
- Welding Bandsaw Blades

The Above titles give some idea of what RMI offers. In addition are the following:

Engine Lathe: 23 videos; Surface Grinding: 10 videos

Heat Treating: 1 video; Drilling: 6 videos

Jlg Borer: 3 videos; Belt Sander: 1 video

Cylindrical Grinder: 2 videos; Turret Lathe: 2 videos

Milling Machine: 18 videos; Shaper: 2 videos

CNC Operations: 11 videos (in addition to those mentioned above)

(15)

Society of Manufacturing Engineers (see Associations)

SME offers a series of videocassettes on the subjects of automated and traditional manufacturing. The following are a few of their offerings most relevant to material removal processes. A 10-minute preview tape is available for a two-week rental period. The cost of rental may be deducted from the purchase price.

Conventional Metal removal package:

The Lathe 17 min.
Milling 9 min.
Drilling and Boring 25 min.
Abrasive Machining 11 min.
Broaching and Shaping 16 min.
Finishing and Deburring 16 min.

Non-Conventional Metal Removal Package

Electric Discharge Machining 16 min.
Laser Drilling 8 min.
Chemical Milling 11 min.
Abrasive Flow Machining 11 min.
Electrochemical Machining 13 min.
Electrochemical Grinding 13 min.

SME also offers a 4-video metal processing package covering forging, casting, rolling, and powder metallurgy. These tapes run from 13 to 28 min. Additional tapes from SME include: heat treating; gauges and measurement; lasers in manufacturing, CAD/CAM; cutting tools; adaptive control; flexible manufacturing systems.

(16)

Technical Consultants Inc.
585 Gunwale
Longboat Key, Florida 34226
813-383-4283

TCI offers a series of 11 videos on geometric dimensioning and tolerancing. Each video being approx. 1 hour in length, the series provides an outstanding in-depth analysis of the subject. A workbook is available.

(17)

Technicomp
111 Chester Avenue
Cleveland, Ohio 44114
1-800-735-4440

Technicomp, a subsidiary of Brown and Sharpe, specializes in video-based quality skills training programs. All materials are available for a free, 15-day preview. Technicomp materials are not sold outright, but are licensed or rented. Programs available are listed below.

Basic Statistical Process Control:

- The Basics of Statistical Process Control
- Introduction to Variables
- Introduction to attributes
- Problem Analysis

Masters Statistical Process Control:

- Overview of Process Capability and Control
- Variables: Control Charts, Calculations and Capability
- Attributes: Control Charts, Calculations and Capability
- Implementing SPC and Problem Solving

Process Control for Short Production Runs:

- Traditional Approaches to Process Control
- Variations in Conventional Control Charts
- Short Run Chart for Variables Data
- Short Run Chart for Attributes Data

Measurement Systems Analysis Series:

- Variable Gage Short Study
- Variable Gage Long Study
- Attribute Gage Studies
- Gage Performance Studies
- Gage Control

Problem Solving Series:

- Steps of Problem Solving
- Problem Identification Tools
- Data Gathering Tools
- Data Analysis Tools

Basic Dimensional Measurement Series:

- Basic Linear Instruments
- Fixed Gages
- Surface Plate Equipment and Methods
- Dial Indicators
- Pneumatic Gaging
- Optical Comparators
- Coordinate Measuring Machines
- Surface Texture Measurement

Coordinate Measuring Machines

- Introduction to CMM's
- Basic Operation
- Demonstration of Measuring Techniques
- Practice Exercises

Geometric Dimensioning and Tolerancing

- Introduction to Geometric Dimensioning and Tolerancing
- Symbols and Basic Principles
- Form and Orientation Tolerance
- Profile, Runout & Location Tolerances

Quality Function Deployment

- Introduction to QFD
- The House of Quality (HOQ)
- The Voice of the Customer
- Phases of QFD
- Starting a Pilot QFD Study

The Taguchi Approach to Quality Optimization

- Overview of Quality Optimization
- Basic Experimental Designs
- Advanced Experimental Designs
- Analysis of Results
- Loss of Function

Cost of Quality

- Introduction to Cost of Quality
- Implementing the Cost Of Quality
- Slide Presentation (to accompany quality proposals)
- Computer Software Program (to calculate cost of quality)

(18)

Video Training Resource, Inc
7500 W 78th St.
Edina, MN 55435-2889
1-800-828-8190
1-612-944-8190

VTR offers a 5-day free sample video from any of their videotape series, and will lease video tapes upon request. They also prepare custom videotapes for specific industrial training needs. Video cassettes of interest included in the "Industrial Technology Video Catalog" include: (length of each videotape is not given in catalog)

Training

- Selecting Goals: Deciding What to Train
- Defining Training Goals
- Lesson Plans, Part 1: Designing Effective Training

Lesson Plans, Part 2: Planning for Skills Training
Presentation Techniques: Teaching in Three Domains
Training with Video
Making it Stick
Evaluation and Reports

Basic Machine Technology

Safety Procedures and Guidelines
Hand Tools and Their Use
The Use of Measuring Tools
Micrometer, Telescope Gages, Caliper, Hole Gages
Vernier Scale and Vernier Caliper
The Use of Layout Tools
The Pedestal Grinder
Sharpening Drill Bits by Hand and Machine
Drill Presses (sensitive and radial)
Operations on the Drill Press
Hand Hacksaw and Filing Procedures
Vertical Bandsaws- Parts and Accessories

Basic Engine Lathe-14 videos

Intermediate Engine Lathe-14 videos

Milling and Tool Sharpening-14 videos

NC and CNC: 20 videos

Geometric Tolerancing

Intro. to Geometric Tolerancing
Geometric Tolerancing

Blueprint Reading

Pulley Bar-basic
Wheel Puller-intermediate
Toolmaker's Vise-Advanced

Shop Math

Whole Numbers and Fractions
Decimals and Tolerances
Equations and Formulas
Angles, Triangles and Trigonometry
Basic-Four Function Calculator

(19)

Vocational Media Associates
Mount Kisco, New York, 10549
800-431-1242

Vocational Media Associates (VMA) distributes filmstrips, videos, slides and books in approximately 19 vocational

areas. Since Prentice-Hall Media has been sold to VMA, and since titles produced by JAM Handy were distributed by Prentice Hall, some of the original Jam Handy materials may be found in the VMA catalogs. The following materials of interest are listed in the 1989 VMA catalog:

Safety in the Machine Shop: 2 filmstrips

Introduction to Metallurgy: 41 min. 3 parts. filmstrips, or filmstrips-on-video

Machinist' Vocabulary Skills: 3 parts. filmstrips.

Machine Shop: General Introduction: Parts 1 and 2. 7 parts. filmstrips or sound slides.

Bench Operations: 5 parts. filmstrips

Drill Press: 4 parts. filmstrips

Tool and Cutter Grinder Basics: 6 parts. filmstrips or sound slides.

Tool and Cutter Grinder Operations: 7 parts. filmstrips or sound slides

Metal-Cutting Bandsaw: 4 parts. filmstrips or sound slides.

Drill Press: 3 parts. filmstrips or sound slides.

Surface Grinder Basics: 4 parts. filmstrips or sound slides

Pedestal Grinder: 5 parts. filmstrips or sound slides

Engine Lathe Basics: 6 parts. filmstrips or sound slides

Engine Lathe Operations - Part 1: 8 parts. filmstrips or sound slides

Engine Lathe Operations - Part 2: 7 parts. filmstrips or sound slides

Engine Lathe Operations - parts 3: 6 parts. filmstrips or sound slides

Engine Lathe Skills: 6 parts. filmstrips

Vertical Milling Machining Skills: 4 parts. filmstrips

Vertical Mill Basics: 5 parts. filmstrips or sound slides

Vertical Mill Operations - part 1: 6 parts. filmstrips or sound slides

Vertical Mill Operations - part 2: 8 parts. filmstrips or sound slides

Horizontal Mill Basics: - 5 parts. filmstrips or sound slides

Horizontal Milling Machine Skills: 5 parts. filmstrips

Horizontal Mill Operations: 8 parts. Filmstrips or sound slides

As noted in the beginning of this chapter, the periodical American Machinist is now including as a fairly regular department "New Videos". Listed below are some of the relevant entries in that periodical. All are in VHS video format.

(20)

Abrasive Flow Machining: 15 min.
Dynetics Corp.
30 Nashua Street
Wobury, Massachusetts 01801

(21)

Axon Sparkdrill Portable EDM Demo: 40 min.
Axon EDM Inc.
3820 E. Michigan Ave.
Clinton, Michigan 49236

(22)

Blind Spline Broaching: 10:25 min.
Apex Broach and Machine Co.
6401 E. Seven Mile Road
Detroit, Michigan 48234

(23)

Chemtool Electrochemical Deburring: 19 min.
Chemtool Inc.,
250 St. John Street
P.O. Box 248
Lorretto, Minnesota 55357

(24)

CNC I.D. - O.D. Grinding: 27 min.
Weldon Machine Tool Inc.
180 West King
York, PA 17404

(25)
CNC Tool and Cutter Grinding: 18 min.
Walter Grinding, Inc.
243 Industrial Ct.
Fredericksburg, VA 22401-2443

(26)
High Speed Spindles: 10 min.
The Precise Corporation
3715 Blue River Ave.
Racine, Wisconsin 53405

(27)
Komet Modular Tooling: 25 min.
Komet R.B. Inc.
3320 Tollview Drive.
Rolling Meadows, Ill 60008

(28)
NC-Link Features of NC Software: 20 min.
Compucor, 1250 N. Lakeview
Suite D
Anaheim, CA 92807

(29)
Aluminum Premachining Operations: 9 min.
TCI Aluminum
240 E. Rosecrans Ave.
Gardenia, CA 90248

(30)
Benefits of Superfinishing: 6 min.
Supfina Machine Co. Inc.
Industrial Road
P.O. Box 01864
Cumberland, RI 02864

(31)
Water-Jet Cutting System: 25 min.
Ingersoll-Rand Co.
635 W. 12th Street
Baxter Springs, Kansas 66713

The following videotapes have been received by the author from private industry:

(32)
Cooper Tools #11: Nicholson File
P.O. Box 30100, Raleigh, N.C. 27622
This is a 35-min. video depicting the manufacturing of Nicholson files, from incoming stock to inspected file.

(33)

Ohio Broach and Machine Company
35264 Topps Industrial Pkwy
Willoughby, Ohio 44094
A 13-min. presentation of industrial broaching applications

(34)

Laserdyne
6690 Shady Oak Road
Eden Prairie, MN 55344
A 27-min. demonstration of the applications of Laserdyne's
9-axis CNC laser-machining/welding center.

(35)

Turchan Enterprises, Inc.
12825 Ford Road
P.O. Box 945
Dearborn, MI 48126
313-581-0043
A 7-min tape which presents a combination drill, tap and
chamfering cutting tool to be used by 3-axis machining
centers

Further videos produced by private industry have been
compiled by NMTBA - see entry #11, this chapter.

Audio-Visuals Indexed By Subject

Traditional Material Removal

Bandsawing 5,14,17,18,19
Broaching 12,15,22,33
Engine Lathe 2,3,5,8,12,13,14,15,18,19
Drilling, Reaming 1,2,3,5,7,10,18,19,
Hobbing 12
Jig Boring 14
Milling 2,3,4,5,8,12,13,14,15,18,19
Principles of machining, Introduction to 1,8,18,19
Threading 5,13

Grinding 4,12

Cylindrical 14
Surface 2,5,19
Tool and Cutter 18,19
CNC 24,25
Superfinishing 30
Electrochemical 15,23
Abrasive Machining 15
Pedestal 18,19

Non-traditional Material Removal

Abrasive Flow 15,20
Chemical Milling 15
Electrical Discharge 15,21
Electrochemical 15,23
Laser 15,34
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Bench Work and Layout 2,3,5,14,18,19

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CAD/CAM, Automated Manufacturing 1,2,4,10,14

Die-making 13

Finishing, Deburring 15

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Heat Treating 14,15

High Speed 26

Industrial History 2,12

Inspection, Statistical Process Control 17

Metal Spinning 3,5

Metrology 2,9,5,12,14,15,17,18

Metallurgy 19

NC, CNC 1,5,6,8,14,18,28

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Robotics 1,2,4,10,14

Shop Math 18

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Vocabulary Skills 19

CHAPTER 4. PUBLISHERS

Listed below are the major publishers of books dealing with material removal. Not included are comprehensive (encyclopedia) references, which are listed in Chapter 7). The publications of organizations, such as the Society of Manufacturing Engineers, are listed in Chapter 2 under the appropriate association. There is a subject index at the end of this chapter for the reader's convenience.

(1)

American Technical Publishers, Inc.
(formerly American Technical Society)
1155 West 175th Street
Homewood, IL 60430
1-800-323-3471

Machine Trades Blueprint Reading
Inne, Streeter 6th ed. spiral bound

Print Reading for Machine Shop
Riggs, 164pp. spiral bound

Machine Shop Operations and Setups
Lascoe, Nelson, Porter 4th ed. 582pp. hard cover

(2)

Audel
Macmillan Publishing Company
General Books Division/Ordering and Billing Dept.
Front and Brown Streets,
Riverside, NJ 08075

1940's editions of Audel's Machinist's and Tool Makers Handy Book may occasionally be found in used book stores. The following three books are their successors.

Machinists Library
Rex Miller Fourth Ed. 3 vols. Hardcover 1352 pp.

ISBN 0-672-23380-0
Vol I: Basic Machine Shop 392 pp.
Vol II: Machine Shop 528 pp.
Vol III: Toolmakers Handy Book 432pp.

(3)

Delmar Publishers, Inc.
2 Computer Drive
Box 15015
Albany, NY 12212-5015
1-800-347-7707
FAX 1-518-459-3552

Basic Blueprint Reading and Sketching
Olivo, Payne @ Olivo 1988 200pp. 5th ed. softcover

Elementary Blueprint Reading for Machinists
Taylor 163 pp. 3rd ed. softcover.

Machine Trades Blueprint Reading
Taylor 368 pp. softcover.

Blueprint Reading and Technical Sketching for Industry
Olivo 464 pp. softcover.

Blueprint Reading for Machinists-Advanced
Taylor, 224 pp. 4th ed. softcover.

Blueprint Reading for Machinists-Intermediate
Taylor, 160 pp. 4th ed. softcover.

Print Reading for the Machine Trades
Pouler 393 pp. spiralbound.

Fundamentals of Numerical Control, 2nd Ed.
Luggen 287 pp. 1989 hardcover

Modern Machining Technology
Baril 698 pp. hardcover.

Computer Numerical Control: Concepts and Programming
Seames 415 pp. Hardcover.

Benchwork Dixon 211 pp. softcover.

Jig and Fixture Design 2nd Ed.
Hoffman 288 pp. softcover.

Mathematics for Machine Technology 2nd. Ed.
R. Smith 372 pp. softcover.

Practical problems in Mathematics for Machinists
Hoffman @ Davis 266 pp. softcover, 1988.

Grinding Technology
Krar @ Oswald 269 pp. softcover.

Turning Technology: engine and Turret Lathes
Krar @ Oswald 281 pp. softcover.

Fundamentals of Machine Technology
Olivo 640 pp. hardcover.

Advanced Machine Technology
Olivo 880 pp. hardcover.

Fundamentals of CIM Technology
Goetsch 342 pp. hardcover 1988.

CIM: Software and Student Manual
Wysk, Chang @ Wang (software to simulate CIM on a IBM PC).

Practical Problems in Mathematics for Machinists, 3rd. Ed.
Hoffman and Davis 266 pp. softcover 1988.

Mathematics for Machine Technology, 2nd Ed.
Smith, 372 pp. softcover.

Mathematics of the Shop
McMackin, Shaver, Weber, Smith 626 pp. hardcover.

Fundamentals of Dimensional Metrology 2nd Ed.
Busch 432 pp. softcover 1988.

Introduction to Manufacturing
Jambro 312 pp. hardcover.

(4)

Gardner Publications, Inc.
6600 Clough Pike
Cincinnati, Ohio 45244-4090
Attn. Book Order Dept.

The following publications are listed in Gardner Publication's "Modern Machine Shop information library", a one-page catalog with prices. All the works cited may not be published by Gardner Publications.

Practical CNC Training for Planning and Shop Use

Part I: Fundamentals

Part II: Examples and Exercises

An instructor's handbook is available for the above volumes, including 60 transparencies.

The Best on Quality targets, improvements, systems

1989 NC/CIM Guidebook

Dictionary of Metalworking Terms

Shop Control '89 Conference Proceedings

(5)

Glencoe Publishing Co.
15319 Chatsworth St.
Mission Hills, CA 91345
800-257-5755

The 1989 Technology Education Catalog lists these textbooks of interest:

Metalwork Technology and Practice

Repp, McCarthy 8th ed. 702 pp., 1989 hardback.

Metalwork

Feirer, Lindbeck 284 pp. hardback.

Metalwork, SI Metric Edition

Feirer, Lindbeck 326pp. hardback.

Technical Metals

Johnson 512 pp. hardback.

Manufacturing Processes

Johnson 580 pp. hardback.

Computer Numerical Control Simplified

Fitzpatrick 298 pp. hardbound.

General Industrial Machine Shop

Johnson 559pp. hardbound.

Machine Tool Technology
Repp, McCarthy 625pp. hardbound.

Shop Mathematics
Felker 420pp. hardbound.

Production Technology
Feirer, Lindbeck 448pp. hardbound.

General Industry and Technology
Lindbeck, Lathrop 458pp. hardback.

Blueprint Reading and Sketching
Lightle, 3rd ed. 96 pp. soft cover.

Learning to Read and Make Mechanical Drawings
Bartholomew, Orr 112 pp. soft cover.

Blueprint Reading For The Technician
Stegman 342pp. soft cover with perforated pages.

Geometric Tolerancing
Marelli 226pp. soft cover.

Machine Shop Projects
Knight 2nd Ed. 112pp. 22 projects.

(6)

Goodheart Wilcox
123 West Taft Drive,
South Holland, Illinois 60473-2089
1-800-323-0440
1-312-333-7200

The 1989 Goodheart Wilcox "Industrial and Technical Catalog" lists these books of interest:

Geometric Dimensioning and Tolerancing
Madsen 240pp. soft cover 1988.

Machining Fundamentals
Walker 544pp. 1989

Blueprint Reading for Industry
Brown 342pp. spiral bound 1986.

Machine Trades Print Reading
Barsamian @ Gizelbach 208pp. soft cover 1986.

Processes of Manufacturing
Wright 464pp. hardbound 1987

Exploring Manufacturing
Wright 272pp. hardbound 1985

(7)

Industrial Press Inc.
Dept. 8800
200 Madison Ave.
New York, NY 10016
(212) 889-6330

The 1988 Industrial Press Catalog lists these relevant publications:

Machinery's Handbook 23 ed. see Chapter 7.

Handbook of dimensional Measurement Farago, 2nd ed. 524pp.
ISBN 0-8311-1136-4 1982

Inspection and Gaging
Kennedy, Hoffman, Bond 6th ed. 654pp. 1987 ISBN 0-8311-1149-6

Application of Metal Cutting Theory
Gorczyca 275pp. hardback 1987 ISBN 0-8311-1176-3
Theory and application, basic scientific and economic concepts of the subject.

Metal Cutting Tool Handbook see Chapter 7.

Basic Machining Reference Handbook
Meyers and Slatterly 320pp. 1988 ISBN 0-8311-1174-7

Creep Feed Grinding
Andrews, Howes, Pearce 256pp. 1985 ISBN 0-8311-1167-4

Abrasives Methods Engineering
Farago Vol I 366pp. 1976, Vol. II 508pp. 1980 hardbacks
ISBN 0-8311-1112-7, 1134-8

Jig and Fixture Design Manual
Henriksen 312pp. hardback 1973 ISBN 0-8311-1098-8

Principles of Numerical Control
Childs 3rd ed. 300pp. hardback 1982 ISBN 0-8311-1135-6

Numerical Control Part Programming
Childs 354pp. hardback 1973 ISBN 0-8311-1099-6

Student's Shop Reference Handbook

compiled by Hoffman 1986, 530pp. ISBN 0-1183-1161-5

Machine Shop Practice

Moltrecht 2nd ed. Vol. I 496pp. Vol. II 517pp. hardbacks
1981. ISBN 0-8311-1126-7, 1132-1

Machine Shop Training Course 5th

Jones 5th ed. Vol. I 570pp. Vol. II 566 pp. hardbacks 1964.
ISBN 0-8311-1039-2, 1040-6

Technical Shop Mathematics

Anderson 2nd ed. 500pp. hardback 1983 ISBN 0-8311-1145-3.

(8)

John Wiley and Sons, Inc.
605 Third Ave.
New York, NY 10158-0012
212-850-6000

John Wiley publishes the following books of interest, as
listed in their 1988/89 Business, Technical and Occupational
Education Catalog:

Numerical Control Programming: Manual CNC and APT/Compact II
Stanton, 491 pp., 1988.

Tool Design for Manufacturing
Curtis, 451 pp., 1986. Includes geometric tolerancing.

Machine Tool Practices, 3rd Ed.
Kibbe, Neely, Meyer, White, 870 pp., 1987.

Student Workbook to accompany Machine Tool Practices
Kibbe, Neely, Meyer, White, 216 pp. 1987.

Introduction To CNC Operation
Lugen, 296 pp., 1986.

(9)

Lindsay Publications Inc.
P.O. Box 12, Bradley, IL 60915-0012
815-468-3668

Lindsay Publications publishes a quarterly catalog "Lindsay's
Technical Books" which advertises their current offerings in

great detail, with lots of illustrations (and exclamation marks). Lindsay reprints technical texts of the first half of the century, and their catalog is worth obtaining for its entertainment value alone. Examples of interest in their Fall 1989 Catalog include:

Accurate Tool Work

Goodrich and Stanley 217 pp. Softcover
First published in 1907-8.

Metal Spinning

Reagan and Smith
80 pp. Softcover
A 1936 technical school textbook

Shop Theory

Henry Ford Trade School 1942 ed.
267 pp. Softcover

Machine Tool Reconditioning

(Applications of Hand Scraping)
E.F. Connelly 533pp. n.d.

Advanced Machine Work

Robert Smith
A 1925 ed. reprint
800 pp. Hardcover

(10)

McGraw-Hill
Gregg Division
1221 Avenue of the Americas
New York, NY 10020
1-800-722-4726

Western Regional Office:
8171 Redwood Highway
Novato, CA 94945

The 1989 Trade and Technical Education Catalog lists these books of interest:

Programmed Blueprint Reading

Shriver @ Helsel, 3rd ed. 224pp. 1975.

Reading Engineering Drawings Through Conceptual Sketching

Helsel @ Cooper, 219pp. 1979.

Technology of Machine Tools

Krar, Oswald, Amand, 3rd ed. 672pp. 1984.

Machine Tool Operations

Krar, Amand, Oswald 400pp. 1983.

Visutext for Machine Tool Operations (photographic approach)

Krar, Oswald, Amand, 208pp. 1983.

Machine Shop Operations-Visutext (photographic approach)

Krar, Oswald, Amand 124pp. spiral bound.

Machine Tool Metalworking

Feirer, Tatro 576pp. 1973.

General Metals

Feirer, 6th ed. 512pp. 1986.

Shop Theory

Anderson, Tatro, 6th ed. 576pp. 1974.

Numerical Control for Machine Tools

Barron, 250pp. 1971.

Metalworking Technology

Little, 430pp. 1977

Programming for Numerical Control Machines

Roberts, Prentice 294pp. 1978 .

Computer-Automated Manufacturing

Powers 368pp. 1987

Basic Manufacturing Processes

Kazanas, Greor, Baker 384pp. 1981

Manufacturing Processes

Roberts, Lapidge 454pp. 1977.

Tool Design

Donaldson, LeCain, Goold 3rd. ed. 784pp. 1973

(11)

Oxford University Press

Oxford Series on Advanced Manufacturing

200 Madison Avenue

New York, NY 10016

Metal Cutting Principles Milton C. Shaw 1984. 594 pp.

(12)

Prakken Publications, Inc.
416 Longshore Drive
P.O. Box 8623
Ann Arbor, MI 48107-9985

Machinist's Ready Reference compiled by C. Weingartner;
wirebound, 312 pp.

Properties and Uses of Ferrous and Nonferrous Metals
H.C. Kazanas; soft cover 119 pp.

(13)

Prentice Hall
College Operations
Englewood Cliffs, NJ 07632

Prentice Hall lists the following books of interest in
their "Mechanical Technology" catalog:

Blueprint Reading For The Machine Trades
Schultz, 2nd ed 320 pp., 1988

Math for Machine Trades
Goetsch, Goetsch, Rickman 192 pp., 1988

Tool and Die Design
Pollack 2nd Ed. 572 pp., 1988

Occupational Safety Management and Engineering
Hammer 4th ed. 480 pp., 1989

Numerical Index, In Order Of Appearance, of Texts by subject

Benchwork 3
Blueprint Reading 1, 3, 5, 6, 10, 13
CIM 3, 4
CNC, NC 3, 4, 5, 7, 8, 10
Geometric Tolerancing 5, 6
Grinding Technology 3, 7
Industrial Safety 13
Machine Shop Operations 1, 2, 3, 5, 6, 7, 8, 9, 10
Manufacturing Processes 3, 4, 5, 6, 10
Metal Cutting Theory 7, 11
Metal Spinning 9
Metrics 5
Metrology 3, 7
Safety 13
Scraping 9
Shop Math 3, 5, 7, 12, 13
Tool Design, Jigs and Fixtures 3, 7, 8, 10, 13

CHAPTER 5. LITERATURE FROM PRIVATE CORPORATIONS

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Literature

Abrasive Flow Machining

Dynetics Corp.

The Dynetics Corp. publishes a 4-page bulletin explaining the principles of abrasive flow machining, that is, ". . . a parts-finishing process which flows abrasive grains embedded in a thick but flowable carrier over edges and surfaces of workpieces."

The bulletin provides a good introduction to the process. Upon request the Dynetics Corp. will send a complimentary reprint of Abrasive Flow Machining: Principles and Practices, an 8-page bulletin reprint written by W.B. Berry of Dynetics Corp., published by ASM as part of the Non-Traditional Machining Conference which took place in Cincinnati, Ohio, 2-3 December 1985.

Extrude Hone

The Extrude Hone Corp. publishes several brochures which describe their abrasive flow machining equipment. Extrude Hone will mail lots of glossy material, among which is a reprint from the periodical Metal Finishing (July 1987) describing the process fundamentals, parameters and applications of abrasive flow machining for deburring. Other material discusses applications such as die polishing, aerospace components, consumer and industrial applications.

Ballizing

Ty Miles, Inc.

Ty Miles, Inc., manufacturers of ballizing and broaching

machines, will send a complimentary reprint from the October, 1987 issue of Tooling and Production magazine. This 2-page leaflet discusses the applications and limitations of the ballizing process. In addition, Ty Miles has a useful advertising brochure emphasizing the advantages of ballizing.

Broaching

Ohio Broach and Machine

The Ohio Broach and Machine Company will send the following reprints upon request free of charge:

Fundamentals of Broaching, a reprint from American Machinist Special Report No. 638, Dec. 15, 1969. This is an excellent 11-page introduction to the broaching process. Subjects addressed are: understanding broaching; broach tooth terminology; chip load factor; variety of broaching tools; broach tool materials; commonly broached materials; broaching machines; cutting fluids for broaching.

What You Should Know About Broaching is a reprint from American Machinist Special Report No. 574, Aug. 2, 1965. This 8-page article complements the one above. Subjects discussed include chip load; tool clearance; chip breakers; increment of stock removal; broach tool inserts; sharpening broach tools; tool life; pieces per grind; broaching speeds, etc.

Holemaking is a two-page reprint from Metlfax magazine, December, 1986. The article introduces the process of creating irregularly-shaped holes by broaching.

Ty Miles, Inc.

Ty Miles, Inc. offers a series of 12 complimentary reprints from various periodicals, which discuss broaching as a standard production operation; Fundamentals of High-Speed External Broaching; Why Use Straddle Broaching?; Secondary Broaching of Stampings are typical of the subjects dealt with. The package makes a very good introduction to the process advantages of broaching.

Burnishing

Cogsdill Tool Products, Inc.

Cogsdill Tool Products, Inc. distributes a catalog of their roller burnishing products that contains several pages

of information about the process parameters. Surface preparation, stock displacement, speed and feed recommendations are discussed. In addition, Cogsdill will send upon request a complimentary reprint of Roller and Ball Finishing-Burnishing (by Cogsdill personnel) as it appears in chapter 16, of volume 3 in the fourth edition of Tool and Manufacturing Engineers Handbook published by SME. This 16pp. article discusses the advantages and limitations of roller burnishing, deep rolling and roller finishing (three distinct operations), process principles, effects, machines and tooling used, and operating parameters.

Elliot Company

The Tool and Pump division of the Elliot Company, manufacturers of roller burnishers, publishes a 35-page bulletin (Y-84C-1) describing their tool line. The first two pages are very instructive, explaining what roller burnishing is and how it works.

Diamond Machining

Pneumo Precision, Inc.

Pneumo Precision manufactures machining systems dedicated to the use of diamond cutting tools. The 17-page booklet A Designer's Guide to Diamond Machined Optics discusses the machining of materials using diamond tooling. Emphasis is on the machining of optical elements. A valuable bibliography on the subject of diamond machining is included in the booklet.

Drills and Drilling

Cleveland Twist Drill

Use and Care of Twist Drills is a 58-page booklet published by Cleveland Twist Drill. Discussed are speeds and feeds for drilling, cutting fluids, chip disposal, chipbreakers, chatter, mechanics of chip formation in drilling, drill jigs and bushings, small diameter holes, deep holes, types of materials, types of drills and drill sharpening.

Eldorado Tool and MFG. Corp.

The Eldorado Tool and MFG Corp., manufacturers of gundrills and gundrilling machines, publishes a 24-page booklet on the subject. Topics presented include economics,

tolerances and critical factors, controlled sharpening techniques, techniques and tools for precision applications, fixturing, industrial production of parts, machines and coolant systems for gundrill and "gunbore" tools

Oliver Instrument Company

Oliver, makers of fine drill sharpeners (industrial quality) publish a 12-page brochure (882-10M) of their machines. The first page is devoted to an illustrated discussion of why the clearance angle of drills should vary along the cutting edge. Page 11 has some fine illustrations of correct web thinning and chip breaker grinding.

How to Get Better Holes From Your Twist Drills is a complimentary 10-page reprint from Machine and Tool Blue Book. This is a fairly intensive discussion of drill point geometry.

Electrochemical Machining

Anocut Inc.

The Anocut Corp. will upon request send without charge several informative "files" which explain the ECM process. Files 1917 and 1910 display application photos (gas turbine blades, etc. machined by ECM). Files A2501, 2520, 1500-1503, 1452, 1454 discuss ECM equipment: power supply units, ECM surface grinders, controls, etc. Files A1006, A1009, 1008, 1013 are technical reports. They cover such areas as ECM machining of titanium alloys; process variables; reverse-flow tooling for ECM, ECM machining rates. Together these files, each of which is 1 - 2 pages in length, provide the reader with a good introduction to the subject.

Chemtool Incorporated.

The Electro Chemical Deburring Tool Design Manual is a splendid 45-page introduction to electro chemical deburring. The publication deals with electrode design and electrolyte flow path; fixture design; important considerations in ECD. Included in the booklet are 25 references.

Also, Chemtool distributes: a complimentary SME technical paper Designing ECD Tooling by Chemtool President Jerome Miller (1979); an undated ASTM reprint Effects of ECMR on Mechanical Properties of Metal; and a 3 pp. Chemtool publication ECM Deburring the Chemtool Way, which lists 66 examples of ECM deburring, giving cycle time, amperage and voltage.

Electrical Discharge Machining

Eltee Pulsitron

Eltee Pulsitron publishes a 19-page educational pamphlet: Understanding the EDM Process and the Power Supply Which Controls It. This paper is written for the machinist, and is a lucid and informal presentation.

Hausermann Abrading Process Co.

Hauserman manufactures machines which shape 3D graphite EDM electrodes by abrading, as an alternative to machining by NC or tracer milling. Among the interesting educational and advertising materials they offer are: Hauserman Abrading Process Co. Tech Bulletin. This 3-page article describes the development of the process. Also offered is a reprint from CNC/WEST, June, 1988; How Abrading works to benefit the EDM Process.

Another manufacturer of EDM-electrode abrading tools is Extrude Hone, whose 11-page advertising brochure of their system is very informative.

Latrobe Steel

Latrobe Steel's Tech-Topics bulletin 106: Electrical Discharge Machining Metallurgical Aspects is a 3-page discussion of the problem of failure of EDM'd parts due to a fully-hardened surface layer produced by the process.

Morgan Industries, Inc.

Morgan Industries, a manufacturer of EDM machines, will mail free of charge Fundamentals of the EDM Process, a 16-page reprint from an article appearing in EDM Digest. Discussed are an introduction to the process; development of the theory of EDM; the power source; surface integrity; fatigue and failure of EDM'd surfaces; effects of the heat affected zone on fatigue strength.

Poco Graphite

Poco Graphite, manufacturer of high-quality graphite EDM electrode materials, publishes a 65-page EDM Technical Manual. This booklet, in its 5th edition, discusses the basic principles of thermomechanical metal removal, popular electrode materials, how to machine graphite electrode

materials, along with a chapter on why Poco Graphite materials are the best. There are quite a few charts on material removal rates vs. surface finish for different qualities of Poco Graphite electrodes.

Files, Filing

Cooper Industries: Nicholson File

Nicholson publishes a small 27-page booklet that introduces the file. Includes a discussion of file terminology, applications, and a "job by job" file selector. See also the video Nicholson produces on the manufacture of files, Chapter 3.

Gear Manufacturing

American Pfauter Limited

American Pfauter Ltd. publishes Gear Process Dynamics, a hard bound book of approximately 250 pages dealing with the subject of gear manufacturing. This work is a detailed discussion of modern gear manufacturing, with the following chapter headings:

Gear Process Dynamics; Advances in Gear Manufacture and Measuring Techniques through Computer Microprocessor Control; Analytical Gear Inspection; A Consideration of Gear Noise Sources in Vehicle and Machine Tool Transmissions; Basic Considerations for Hobbed Gear Accuracy; Basic Considerations for Determining Productive Efficiency: CNC Controlled Hobbing; Automation and Flexible Gear Manufacturing Systems; Effects of Hob Quality, Hob Resharpening and Hob Set-Up on Gear Accuracy; Conditions for and Peculiarities of Multi-Start Hobbing; Workholding Fixture Systems; Tool Life and Cost Considerations; Hard Gear Skiving; Gear Grinding Systems Comparisons.

Fellows Corporation

The Fellows Corporation, manufacturers of gear-cutting machine tools, publishes an 87-page booklet The Involute Curve and Involute Gearing, which is an introduction to the theory of this subject. The first edition of this booklet was published in 1910; this is the eighth edition. Topics discussed include: function of gearing and applications of the involute to gear teeth; design of involute gear teeth; generating and checking involute gear teeth; definitions of gear elements. This book is a fine introduction to gear geometry.

The Internal Gear is a 79-page booklet which discusses internal gears as they are applied to splines, planetary gears, etc. Included in the booklet is a discussion of the advantages of internal gears; design of internal gears; graphical analysis of gear tooth action, internal helical gear design; strength of gear teeth; graphical generation of the involute curve.

Gleason

The Gleason Corporation distributes free of charge several fine monographs, symposia proceedings, and technical papers which discuss gear manufacturing. These are listed below:

Understanding the Phoenix Universal Bevel Gear Generator. A 6-page introduction to the electronic controls involved in the design a CNC bevel and hypoid generator.

The Theory of Modern Bevel Gear Manufacturing

A 5-page discussion of methods of manufacturing bevel gears, with emphasis on "tooth contact analysis" computer programs.

Technological Fundamentals of CBN Bevel Gear Finish Grinding
9 pages, with bibliography.

Gleason Bevel and Hypoid Gear Terminology
24 pages of terms.

Gear Cutting Notes A 33-page introduction to gear cutting methods and machines.

The Relationship of Measured Gear Noise to Measured Gear Transmission Errors 6 pp.

Solving Gear Noise Problems With Single Flank Inspection

CNC Analytical Gear Inspection

Understanding the Variables: A Guide to Successful SPC Qualification of Gear Hobbing Machines

The World of Gearing A "first book" on gearing.

National Broach and Machine

Modern Methods of Gear Manufacture is a 159-page book published by National Broach and Machine. Chapters include: Gear Design; Gear Calculations; Material Selection and Heat

Treatment; Machining the Blank; Forming the Teeth; Finishing the Teeth; Inspecting the Teeth; Modern Gear Designs; Special Gear Developments; Red Ring Products and Services for Gear Manufacturers. It would be hard to find a better introduction to gear manufacturing than this work.

Grinding

Bryant

Better Centers is a 7-page bulletin which deals with the necessity of good centers, common errors in machining centers, requirements for good centers and how to produce them. The booklet relates the benefits of using the Bryant center-hole grinder.

Alignment: Internal Grinding is a 12-page booklet discussing the problems of alignment in internal grinding: elements contributing to alignment problems; line of contact between wheel and work; wheel path; wheel form; wheel contact; center height, etc. A fine introduction to factors involved in internal grinding.

Carborundum

The Carborundum Company, Abrasives Marketing Division, publishes a 64-page manual on grinding carbides. Included is a discussion of wheel types; wheel shapes; wheel mounting; dressing, cleaning and truing; feeds and speeds; types of grinding and coolants; stamping dies; milling cutters; drills; reamers; circular form tools; broaches; internal grinding; surface grinding; roll grinding; causes and corrections of common grinding errors; reference tables; abrasive recommendations for carbide grinding; selection of grit size and grain.

Gallmeyer and Livingston

Gallmeyer and Livingston produce a 128-page book (one of very few available on the subject) Universal Tool and Cutter Grinding which discusses grinding machines; adaptations of the tool and cutter grinder to different types of work; grinding wheels; methods of setting up milling cutter tools for grinding. An extensive list of tables is included, along with a glossary of shop terms.

Huffman

The S.E. Huffman Company, manufacturer of CNC cutter grinding machines, distributes free of charge some interesting technical papers and brochures. Among them are:

Tool Grinding: BY And For CNC a 2-page article based upon a paper presented at the 20th Annual Abrasive Engineering Society (see Chapter 2) conference, 1982. This is a good introduction to the subject.

Computer Ground End Mills is an 8-page SME Technical Paper MR88-594 (1988) which discusses new manufacturing technology based upon Huffman's CNC tool grinding machines. The same subject is treated in a Machine Tool and Blue Book reprint New Twist in End Mill Grinding. (June 1981)

Norton

The Norton Company publishes various booklets on different types of grinding processes. A series of booklets in 5 by 7 format includes:

Toolroom Grinding 168pp. discusses types of grinding wheels, tool sharpening operations, tables of useful information.

Surface Grinding 69pp. includes an introduction to surface grinding, wheel selection, machine accessories, special grinding requirements, good grinding operations, problems, safety, grinding fluids.

A Primer on Grinding Wheel Safety 24pp. discusses safety factors of grinding. Included is a table of speed/diameters.

The ABC of Internal Grinding", a 70-page booklet, includes factors in setting up the job, selecting the proper wheel for the job, common grinding troubles.

Grinding, Abrasives and Grinding Wheels, 126 pages in length, is a good introduction to the art of grinding, includes chapters on introduction to grinding, the grinding wheel, diamond and CBN wheels, other elements of grinding, wheel selection, safety, good operation, a glossary, and recommendations for grinding.

Norton also publishes the following bulletins having to do with grinding wheel safety:

ANSI Safety Code for Use, Care and Protection of Abrasive Wheels

Safety Recommendations for Grinding Wheel Operation

Mounting Technique For Wheel Sleeves on Cylindrical Grinding Machines

Cutting-Off Wheels

Handling, Storage, and Inspection of Grinding Wheels

Special Speeds for Grinding Wheels

Portable Grinding Machines: Safe and Efficient Operation Mounted Wheels- Safe Speeds

High Speed-Heavy Duty Grinding Machines-Swing Frames and Floor Stands.

Walter Grinders, Inc.

Upon request Walter Grinders will send a reprint of an SME technical paper MR87-811 Advanced Tool and Cutter Grinding. This 35-page paper presented by the engineering manager of Walter Grinders is from a conference on modern grinding technology at Southfield, Michigan, 1987. The paper is a discussion of cost savings through the use of CNC ground cutting tools.

High Speed Machining

Bryant

Spindles for High-Speed Machining, while being an advertisement for Bryant high speed spindles, provides a lot of introductory information to the subject. The 3-page brochure discusses applications, speeds and feeds, early development, etc.

Leblond Makino

Leblond Makino will send a reprint of Spindles, Controls for Fast Machining" an article from American Machinist, Jan. 1988. The article discusses control problems, machine characteristics, and evaluating high-speed systems, with emphasis on Leblond Makino capabilities.

Honing

General Hone

General Hone publishes a spiral bound catalog which contains a 7-page section on operational information. This section includes nomenclature, grain types and designation, relation of grain size to microinch finish, honing speeds and feeds, relationships between rpm, reciprocation and feed rate. A separate 2-page paper, untitled, deals with selection of honing coolants.

Sunnen Hone

Sunnen will mail free of charge two SME technical papers: MR82-939 Honing, an 8-page introduction to the process. This paper is from a honing technology clinic given in Los Angeles, 1982; X-SP-2301 The Why, When and How of Honing, a 23-page article from a conference given on modern grinding technology, Southfield, Michigan, 1987. This discussion goes into more detail, including several applications. Includes an 8-entry bibliography.

Indexable Inserts

GTE Valenite

Aside from their main sales catalog Total Capability Tooling, GTE Valenite offers a series of 17 smaller publications, some of which are listed below; all are available free of charge.

Milling

- 27-01-149 Data on Usage/Ball Nose End Mills
- 27-07-362 A Profitable Guide to End Milling
- 27-03-243 Pocket Drilling Guide
- 27-06-392 Pocket Tapping Guide
- 27-06-396 Tapping Holders/Product Technical Data
- 27-07-336 Dimension and Tolerance Booklet
- 27-08-321 Tooling Progress Vol 7, No. 1

Greenleaf Corporation

Greenleaf's brochure The Application of WG-300 Whisker Reinforced Ceramic/Ceramic Composites is a fine introduction to factors involved in applying advanced cutting tool materials. The booklet is an 18-page discussion of speeds, feeds, depth -of-cut, wear patterns and geometry considerations.

Kennametal, Inc.

Kennametal publishes many informative brochures to acquaint interested readers with the properties of carbide, tooling systems, etc. Listed below are the materials most relevant to this work.

Kennametal Inc. Although this is an advertisement for Kennametal, there are many informative discussions, profusely illustrated, of the nature of sintered carbide, powder metallurgy, a history of carbide tooling, etc.

Mill Training Program Technical Handbook This 14-page manual includes a milling selection cutter guide which deals with the rake angles of face mills as a function of work material, horsepower consumption, milling formulae, planning the milling operation, speeds and feeds (kennametal grade inserts) troubleshooting milling problems.

Kennametal publishes a set of brochures they call "Problem Solving Library". There are about 31 separate booklets covering different aspects of machining with carbide tooling. To list a few:

1. Metalcutting Theory
2. A Guide to Carbide Insert Type Boring Bar Selection
3. Titanium Planning Setup Breeds New Machining Techniques
4. Find Your Own Speed and Feed
5. Milling for Maximum Material Removal

The Kennametal booklet Designing with Kennametal discusses the design considerations of using carbides: A description of the materials, safety in design, corrosion, methods of fastening, finishing. Although Kennametal brand names are used, the material is applicable to carbides in general.

Sandvik Coromant

Sandvik Publishes three handbooks: Milling Guide, Turning Guide, and Drilling Guide. Totaling around 500 pages, these guides offer information on tooling systems, carbide grades, insert geometry, cutting data, machining economics, and troubleshooting. Also, the large catalog Coromant Metal-working Products - Turning Tools and Inserts has a chapter dealing with technical information which is useful.

Lapping

The Helical Lap Co.

The 5-page booklet Cylindrical Lapping Guidelines deals with the process of internal diameter lapping. Included is an introduction to cylindrical lapping, general guidelines, correcting common geometrical flaws, blind hole lapping technique. This booklet serves as a good introduction to the process of I.D. lapping

United States Products Co.

U.S. Products division of General Electric Co. publishes an eight-page pamphlet Grinding and Lapping Compounds, which discusses types of abrasives, size of abrasives and terminology, hardness testing of metal, types of lapping procedures, lapping "rules of thumb". A lot of educational material is packed into this pamphlet.

Lapmaster International

Lapmaster International publishes a 44-page book Lapping, Polishing and Flatness, which is a company training manual dealing with many subjects relating to flatness, including surface measurement, optical flats, what lapping and polishing is, lapping vehicles, abrasive compounds, lapping and polishing various materials, lapping cycle times, etc. A "material lapping guide" is a useful chart listing the proper lapping abrasives and vehicles for processing 24 types of materials.

Laser Machining

Laserdyne Systems

Laserdyne offers free of charge an eight-page booklet Laser Machining of Plastics which introduces the subject and gives applications and advantages of the process. A second five-page brochure Laser Processing Capabilities briefly introduces laser cutting, drilling, welding, heat treating and marking.

Machining/Machinability

Aluminum Company of America

ALCOA produces a 150 page book Aluminum Screw Machine

Stock, which describes the various facets of machining their screw machine materials. The five alloys 2011, 2017, 2024, 6061, and 6262 are considered from the viewpoint of machinability, physical and chemical properties. Also discussed in this booklet are such topics as machining estimating information; tooling and operating data. The book is available from ALCOA free of charge.

Carpenter Technology

Notebook on Machining Stainless Steels is a 134-page book on factors to be considered when machining corrosion-resistant steels. Various machining operations are discussed, along with cutting fluids, estimating tables, reference tables, introduction to the common stainless series, cleaning processes, honing cutting tools, etc. More than an introduction, this book is a fine reference tool.

Haynes International

Haynes International publishes a 35-page bulletin Fabrication of Hastelloy Corrosion-Resistant Steels, which gives machining and grinding information for these materials.

LaSalle Steel Co.

LaSalle Steel publishes a 276-page handbook (data bulletin 11) Machining Data Handbook, which provides machining data for cold finished and special purpose steel bars. Tables in the handbook show speeds and feeds for different steel/tool combinations. Speed and Feed comparisons are made between carbide and HSS tools for various LaSalle steels.

Trouble Shooting Machining Problems, a 10 pp. booklet by Donald Starr, Sales Engineer, LaSalle Steel Co., attempts to present a systematic approach to solving problems of tool life, variation, concentricity and surface finish. Possible causes considered are the variables: spindle speed, feed, coolant, tooling, machine, part, and human factor.

A second brochure Machining Facts and Common Problems, discusses basic machining variables, machinability ratings and common causes of machining problems. Together both brochures constitute a good introduction to machining variables, problems and possible solutions.

Moore

The Moore Special Tool Company, Inc. publishes a 424-page book entitled Holes, Contours and Surfaces. This book is being offered in place of the original Precision Hole Location (1947). The book deals with jig boring and jig grinding principles and applications; linear form grinding applications; the foundations of accuracy; inspection methods, and other related topics.

Olofsson Corp.

Olofsson Corporation, manufacturers of production turning equipment, publishes an irregular periodical Diametereology, which consists of applications articles. Each four-page issue discusses two applications examples. Upon request Olofsson will send up to 23 different issues of this periodical.

Universal-Cyclops Specialty Steel Division

Machining of High Temperature Alloys is a 38-page booklet dealing with the machining of high temperature iron based, cobalt based and nickel based alloys. Subjects include end working tools, cross slide tools, milling, sawing, tool grinding, advanced metal removal techniques, etc. A nice machining guide chart is included, showing operation speeds and feeds for different materials and processes.

RMI Company

RMI Company, producers of titanium plate, bars and billets, publishes a 35-pp booklet which lists the properties of various titanium alloys. Two pages are devoted to machining titanium, with paragraphs each on milling, turning, drilling, tapping, grinding, and sawing.

Metrology

Moore

The Moore Special Tool Co. Inc. publishes a 353-page hardcover book The Foundations of Mechanical Accuracy, which is one of the finest introductions to this subject available. Included in the book are discussions of the flat plane and how to produce it; geometry as a function of machine wear; standards of length; history of official length standards;

temperature control, and many more pertinent subjects. The book details Moore Special Tool Company's efforts to create machine tools of uncompromising precision. 1970.

Milling

Cincinnati Milling Machine

"Milling Machine Practice", published by Cincinnati Milling Machine Co., is a 24-page introduction to milling. The work is divided into three chapters: Analysis of the Process of Milling; Milling Cutters; Use of Milling Cutters. Within these chapter headings many subjects are discussed, making this a fine introduction to the subject.

Reamers

Cleveland Twist Drill

The 34-page booklet Use and Care of Reamers gives information on the selection of reamers, multiple diameter reamers, use of reamers, speeds and feeds, amount of stock removed, use of bushings, reamer drivers, hand reaming, use in lathes, taper reamers, rigidity, coolants, carbide tipped reamers, troubleshooting, grinding, care of reamers. A short but very informative booklet.

Sawing

The Do-All Company

The Do-all Company publishes various guides both for using their products and for general considerations of sawing processes. These publications include:

The Metalcutting Band Machine

How to Use the Tungsten Carbide Blade

How to Use Band Tools

Machine Shop and Tool Room Band Machining

How to Weld a Band Saw

Production Band Machining

Friction Sawing

How to Select Cutting Fluids

Band Machining for Cut-Off

How to Fixture the Band Machine

Understanding Machinability for Band Machining

To give an idea of the material covered in these booklets, How To Select a Band Saw Blade includes a discussion of cost/performance decisions; saw blade types; cost per cut; saw blade characteristics; selecting the right blade; production pointers; cutting fluids; short cut blade selection.

General Shop Practice

L. S. Starrett Co.

The Starrett Book For Student Machinists (cat. no. 1700) is a 159-page booklet providing an introduction to basic machining processes. Included is a discussion of: Mechanical Drawing; Fits and Technology; Bench Work; How to Make Measurements; Cutting Speeds and Fluids; Drilling and Related Operations; Lathe Operations; Grinding; Metal Sawing; Toolmaking; Geometry; Mechanics; Reference Tables.

Other Starrett publications include:

The Tools and Rules for Precision Measuring (bulletin no. 1211) is a 73-page booklet which introduces the basic precision measuring tools used by machinists, including micrometers, vernier tools, dial indicators, etc. A 38 minute VHS cassette by the same title is available for purchase or loan (free of charge). Write to Starrett for information.

Taps/Tapping

Cleveland Twist Drill

Use and Care of Taps is an 88-page booklet which gives information on selecting style of tap, classes of thread and tap size, thread forming, preparation of holes for tapping, tapping speeds, lubrication, surface treatments (does not mention PVD coatings), process problem troubleshooting, resharpening, pipe tapping, tapping stainless, strength of tapped holes. This booklet is one of the most comprehensive available on taps and tapping.

Greenfield Tap and Die

Greenfield publishes a 63-page booklet Facts about Taps and Tapping, which deals with the history of tapping, screw thread terms, screw thread forms, tap terms, tap limits, styles of taps, surface treatments, resharpening and grinding taps, tapping facts, ordering special taps, and measuring taps. 11 charts and tables dealing with tapping lubricants, tapping speeds, etc.

The Greenfield Tap Guide is a 40-page guide to styles of taps for tapping various materials. General tap descriptions allow the booklet to be used for makes of taps other than Greenfield. A page dealing with tap surface treatments warns us to avoid chrome plated H.S.S. taps when tapping C.R. steels because of increased galling. This is an interesting booklet.

TRW Geometric

The TRW Geometric Co. publishes a 67-page Screw Threading Manual which deals with the proper setting-up of tapping and die heads. The booklet is divided into the following subject areas: self-opening die heads; solid adjustable die heads; die head chasers; tapping heads. The booklet discusses head alignment, work speed, lubricants, threading troubles, setting up self-opening die heads, styles of die chasers, chaser terminology, geometry, sharpening, servicing, collapsing taps, geometry, and sharpening. A section of the booklet deals with screw thread terms and dimensions for various types of thread forms.

Screw Threads

The following 4 booklets are available from Greenfield/Geometric division of TRW:

Screw Thread Manual This 49 page 8 1/2" by 11" booklet gives extensive information on ground thread tap limits, screw thread tolerances and terminology, thread measurement, constants for finding thread elements, the Unified thread system, and pitch diameter limits of threads. A full page of information is given for each common thread size from 0 to 1" in UNF and UNC. Included is: suggested taps and tap drills, thread limits for 1, 2 and 3 A and B classes, thread limits for taps, and much other information in an easy-to-read format.

Facts About ISO Metric Screw Threads This 11-page booklet deals with metric threads. Included is a discussion

of thread form, terminology and designations, basic thread designations for commercial series of ISO threads, classes of thread, gages and gaging ISO threads, and lastly a chart showing the limiting dimensions of standard series ISO metric threads.

ISO Metric Screw Thread Manual The Greenfield/Geometric Div. of TRW prints this 23-page booklet which discusses in detail the ISO metric thread system. Included are: basic designations, tolerance symbols, constants for finding thread elements, ground thread tap limits, limiting dimensions of standard series threads, metric tap drill sizes, 3 wire measurements for metric threads. In addition, each thread size from M 1.6 X .35 to M 24 X 3 is given a full page treatment, including thread limits, drill sizes, etc.

Threading and Gaging Pipe Threads This 11-page booklet deals with dryseal taper pipe threads: NPTF-National Taper Pipe Fuel, PTF-SAE Short Taper Pipe Fuel, NPSF-National Straight Pipe Fuel, NPSI-intermediate straight pipe fuel, NPT-Taper Pipe Threads, NPSC-National Pipe Straight Thread for Coupling, NPSM-National Straight Pipe Thread for Mechanical Joints, NPSL-National Straight Pipe Thread for Locknuts, NH-Standard Hose (garden hose), NHR-Standard Hose with formed thread, NPSH-Standard Hose for assembly with NPT threads, and ANPT-Aeronautical Taper Pipe Threads.

Thread Forming

Teledyne Landis Machine

Teledyne Landis Machine produces 14 booklets dealing with thread rolling, worm gear rolling, and related topics. Titles include:

Everything You Always Wanted to Know About Designing Rolled Worms 12 pp.

Rollability of Materials 12 pp.

Advantages of Rolling Worms 8 pp.

Rolling Applications: Threads, Worms, Splines, Gears 12 pp.

Troubleshooting Tips for Thread Rolling 8 pp.

Getting the Most from Form and Thread Rolling Dies 12 pp.

3-R Manual on Roll Threading 6 pp.

When Should You Roll/Cut Threads? 8 pp.

Update: Metric Threading 8 pp.

How to Cut Acme Threads 12pp.

Die Head/ Tangential Chaser Management 24 pp.

Taps: Adaptation of Standard and Special Taps 12 pp.

Tap/Tap Chaser Management 12 pp.

Hollow Milling 8 pp.

Following is a description of three of these booklets.

Rollability of Materials

Teledyne Landis produces a ten-page booklet which discusses work hardening of metals after rolling, what materials can be rolled, with special consideration given to the effects of nickel, chromium, carbon, brass and bronze, zinc, lead, aluminum, and silicon on the rolling process. Four pages of charts are given for surface finish and die life for about 80 different copper alloys.

When to Roll/ When to Cut Threads

This four-page booklet discusses factors in the choice of rolling or cutting threads. Consideration is given to finish, rollability as a function of % of elongation, threading to a shoulder, depth of thread, and surface speed of tool. Charts are given for rollability of carbon and alloy steels, copper alloys, aluminum alloys, and nickel alloys.

Getting the Most From Form and Thread Rolling Dies

This ten-page booklet goes into some depth in discussing factors contributing to rolling die failures. Types of wear are considered, die quality is discussed, faulty workpiece material is considered the most common cause of die failure. The booklet deals with factors affecting rollability, material inconsistencies, setup and operation of rolling equipment, pre and post rolling inspection, and cooling and lubrication.

Teledyne Landis publishes a monthly newsletter Thread Tips, which typically runs to about 6 pages, and has two feature articles dealing with case studies and technical considerations of Landis products.

TRW Geometric Tool Division

Geometric publishes a 28-page Thread Rolling Manual which describes the thread rolling process and the various Geometric tools that are used for different applications of thread rolling. Discussed are rotary roll heads; "bump" thread rolling; straddle thread rolling; thread rolling definitions; cylindrical die machines.

Addresses of Companies Listed

Aluminum Company of America, 1501 ALCOA Building, Pittsburgh, PA 15219

American Pfauter/Gildemeister, 925 Estes Avenue, Elk Grove Village, Illinois 60007

Anocut Incorporated, 2433 Delta Lane, Elk Grove Village, ILL 60007

Bryant Grinder Corporation, Springfield, Vermont, 05156

Carborundum Company, Abrasives Marketing Division, P.O. Box 337, Niagara Falls, New York 14302

Carpenter Technology Corp. 101 West Bern St. Reading, PA

Chemtool Inc., 250 St. John Street, Loretto, Minnesota 55357

Cincinnati Milacron, 4701 Marburg Ave., Cincinnati, Ohio 45209

Cleveland Twist Drill Co., P.O. Box 91839, Cleveland, Ohio, 44101

Cooper Industries, P.O. Box 728, Apex, NC 27502

Cogsdill Tool Products, Inc., P.O. Box 900, Camden, SC 29078

Do-All Company, Des Plaines, ILL

Dynetics Corporation, Conn at Fowle Street, Woburn, MA 01801

Eldorado, Div. of Quamco, Inc., 336 Boston Post Road, Milford, CT 06460

Elliot Company, Tool and Pump Division, 1760 Tuttle Ave, Dayton, Ohio 45401

Eltee Pulsitron, 26 Fairfield Place, West Caldwell, N.J.
07006

Extrude Hone, P.O. Box 527, 8075 Pennsylvania Ave., Irwin,
Pa. 15642

Fellows Corporation, Emhart Machinery Group: box 851,
Springfield, Vermont, 05156-0851

GTE Valenite, 31100 Stephenson Hwy, Madison Heights, MI 48071

Gallmeyer @ Livingston Co, 336 Straight St., Grand Rapids,
Michigan 49504

General Hone Corp. 471 U.S. 250 East, Rt. 2, Ashland, Ohio
44805

Gleason Corporation, 1000 University Avenue, P.O. Box 22970,
Rochester, NY 14692-2970

Greenfield Industries, Inc., 26 Sanderson St., Greenfield, MA
01301

Greenleaf Corporation, Greenleaf Drive, Saegertown, PA 16433

Hauserman Abrading Process Co. 206 Interstate Road, Addison,
Illinois 60101

Haynes International, 1020 West Park Ave., P.O. Box 9013,
Kokomo, Indiana 46904-9013

Helical Lap Company, 29901 Calahan Road, Roseville, MI 48066

Kennametal Inc. Machining Systems Division, P.O. Box 30700,
Raleigh, NC 27622

Latrobe Steel Co. Latrobe, Pennsylvania 15650

L.S. Starrett Co., Athol, Mass. 01331

Lapmaster International, 6400 W. Oakton Street, Morton Grove,
IL 60053

LaSalle Steel, 1422 150th Street, Hammond, Indiana 46320
Laserdyne, 6690 Shady Oak Road, Eden Prairie, MN 55344

Leblond Makino Machine Tool Company, 2690 Madison Road,
Cincinnati, Ohio 45208-1386

Moore Special Tool Co., Inc., 800 Union Ave., Bridgeport, CT
06607

Morgan Industries, Inc. 3311 East 59th St., Long Beach, CA 90805

Norton Company, Abrasives Marketing Group, Worcester, MA 01606

National Broach and Machine, 17500 23 Mile Road, Mt. Clemens, MI 48044

The Ohio Broach & Machine Company, 35264 Topps Industrial Parkway, Willoughby, Ohio 44094-4684

Oliver Instrument Company, 831 Division Street, P.O. Box 189, Adrian, MI 49221

Olofsson Corporation, 2727 Lyons Ave., P.O. Box 27308, Lansing, MI 48909-7308

Pneumo Precision, Inc., Precision Park, P.O. Box 543, Keene, N.H. 03431

Poco Graphite, Inc. A Unocal Company. 1601 State Street, Decatur, TX 76234

RMI Company, 1000 Warren Ave., Niles, Ohio 44446

S.E. Huffman Corporation, P.O. Box 255, Clover, S.C. 29710

Sandvik Coromant Co. 1702 Nevins Rd. Fair Lawn, N.J. 07410

Sunnen Products Co. 7910 Manchester Ave., St. Louis, Mo. 63143

Teledyne Landis Machine, 5th and Church Streets, Waynesboro, PA 17268

TRW Geometric Tool Division, 1 Valley Street, New Haven, Connecticut 06515

Ty Miles, Inc., 9855 Derby Lane, Westchester, ILL 60153

United States Products Co. 518 Melwood Ave., Pittsburgh, PA 15213

Universal-Cyclops Specialty Steel Division, 650 Washington Road, Pittsburgh, PA 15228

Walter Grinders, Inc. Fredricksburg, VA

CHAPTER 6. INFORMATION SYSTEMS AND SERVICES

On-line databases constitute the most efficient means to access current technical information, and are subscribed to by many university and public libraries. Two database systems are dealt with below: DIALOG and BRS. Both are compilations of individual data bases concerned with many widely varying fields of knowledge. Contained within these database systems are three databases that are of particular importance here: COMPENDEX, an on-line form of the Engineering Index; METADEX, the on-line form of Metals Abstracts; and ISMEC, the on-line database from Cambridge Scientific Abstracts. A fourth database of relevance here is WILSON-LINE, the on-line version of Applied Science and Technology Index. While the first three databases may be accessed via BRS or DIALOG, Wilsonline may not, and must be subscribed to separately. Each of these four databases is discussed below.

Utilizing the four databases mentioned above, A search was conducted on 7/5/1989 for periodical and conference articles using as descriptors the terms "computer numerical control (or) CNC" in their titles.

The search was for articles dating from 1984 to the present (1989). The number of entries found in each database is as follows:

WILSONLINE: 534
ISMEC: 389
METADEX: 101
COMPENDEX PLUS: 293

The results of this search do not really establish the relative importance of each database to the subject, since indexing techniques vary from one database to another; the Applied Science and Technology Index covers relatively fewer resources related to machine tool technology than the other indexes, but it does not discriminate or select articles within its coverage as other data bases do. The number of entries shows what a wealth of information is stored in databases today.

BRS Information Technologies
(Bibliographic Retrieval Services)
1200 Rout 7
Latham, NY 12110
800-345-4277

BRS Information Technologies is a compilation of approximately 150 databases covering many subjects. Included in the system are the COMPENDEX database, an on-line version of the Engineering Index; Current Contents: Technology and Applied Sciences, an on-line version of the Current Contents Index; Dissertation Abstracts On-Line; IHS's Vendor Information, and Industry and International Standards; NTIS; (National Technical Information Service); ERIC (Educational Resources in Education); and UMAC, an on-line version of University Microfilms Inc. Also available via BRS is the VECM (Vocational Education Curriculum Materials) database. ERIC and VECM databases are discussed in Chapter 8; other databases are discussed in this chapter.

DIALOG Information Services, Inc.
3460 Hilview Ave.
Palo Alto, CA 94304
414-858-3785

While many information systems and services exist whose subject areas include manufacturing technology, most dealing with high-tech subjects are too expensive or are not appropriate for use by educational facilities. Through the DIALOG database system, however, students and instructors have access to databases whose subject content includes manufacturing processes.

Through Dialog services one can access on-line some 350 data bases (the number increases monthly) divided into 26 subject categories. Within the category of Science and Technology, the following on-line databases are relevant: COMPENDEX PLUS, an on-line version of the Engineering Index; ISMEC, produced by Cambridge Scientific Abstracts, which indexes significant articles in all aspects of mechanical engineering, including production engineering; Metadex, an on-line version of Metals Abstracts; (See ASM); World Aluminum Abstracts (ASM); Supertech, produced by R.R. Bowker, a database dealing with robotics, biotechnology, CAD/CAM, AI, and telecommunications; Standards and Specifications, produced by the National Standards Association, which covers all industry and government standards; IHS Standards and Specifications (see Information Handling Services). Within the category of Social Sciences and Humanities, NICEM may be accessed through A-V Online (Chapter 3). ERIC (Chapter 7) is also available, as file #1.

Many institutions of higher learning subscribe to DIALOG, and to the writer's knowledge at least one California State University department of industrial technology subscribes independently of the university library.

DIALOG conducts many training sessions per year, both introductory and advanced. The following publications which explain the complete services offered by DIALOG are available upon request free of charge: "Knowledge Index"; "Medical Connection"; "DIALOG OnDisc"; yearly "Database Catalog"; "Price List"; "U.S. Training Schedule".

Applied Science and Technology Index

W.H. Wilson Company
950 University Ave.
Bronx, NY 10452
ISSN 003-6986

The Applied Science and Technology Index is published monthly except in July, and consists of a cumulative subject index to English language periodicals in many technical areas. Relevant periodicals indexed include American Machinist, Advanced Materials and Processes, Automation, Manufacturing Engineering, Modern Machine Shop, Modern Metals, and Tooling and Production. Prior to 1956 this index was the Industrial Arts Index, and if one has time to spare, makes very interesting reading.

The Applied Science and Technology Index may be accessed on-line via WILSONLINE, managed by W.H. Wilson Company. WILSONLINE is not included in the BRS or DIALOG system. Resources other than periodicals are not indexed by ASTI.

ISMEC: Mechanical Engineering Abstracts

Cambridge Scientific Abstracts
7200 Wisconsin Avenue
Bethesda, MD 20814
301-961-6750

ISMEC: mechanical engineering abstracts, has been published bimonthly since 1967. 9600 Articles in 1989 were selected from journals, books, patents, dissertations and conference papers. Subjects indexed include production processes, tools and equipment. Periodicals indexed include American Machinist, Cutting Tool Engineering, Manufacturing Engineering, Modern Machine Shop, and Tooling and Production.

Engineering Index

Engineering Information Inc.
345 E. 47th Street
New York, NY 10017-2387
212-705-7600

Engineering Information Inc. provides many products and services related to the dissemination of engineering information. Among these are the following: Engineering Index, a monthly compilation of abstracts with an author and subject index covering the literature of engineering and related disciplines. Abstracted are articles from periodicals, technical reports, and monographs. The Engineering Index Annual is an annual casebound compilation. Back issues are available in print to 1959 and in microfilm from 1884. Ancillary publications exist as aids to using the index, such as a list of publications searched, a subject index, etc.

COMPENDEX (COMPUterized ENgineering INDEX) is the on-line version of Engineering Index. Records number over 1.9 million, dating from 1970. COMPENDEX PLUS is a relatively new (1982) database which merges the Engineering Index with Engineering Meetings to combine journal articles with conference papers. COMPENDEX PLUS may be accessed via DIALOG.

The full text of most of the articles cited in Engineering Index may be ordered directly from Engineering Information Inc. Periodicals indexed by Engineering Index include Carbide and Tool Journal, Machine Tool and Blue Book, Manufacturing Engineering, and Tooling and Production.

Information Handling Services
15 Inverness Way East
Englewood, CO 80150

IHS provides information and indexing services in microfilm hard copy. These are comprised of:

Vendor Catalog Services

microfilms and microfiches of catalogs of industrial suppliers in many manufacturing areas. "

Federal Construction Regulation Services

Military/Federal Standardization Services

U.S. International and Foreign National Standards Services.
IHS publishes an Industry Standards Subject Index and an Industry Standards Numeric Index. One can access ANSI and Other Standards by subject or number via these indexes. IHS

International Standards and Specifications database may be accessed via DIALOG file 92.

One must subscribe to IHS to access their services. Within California, California State Polytechnic University at San Louis Obispo does subscribe, and IHS materials may be found in the reference section of the main campus library. For single copies of a particular standard (including military specifications), a service is provided by a sister company to IHS:

Global Engineering
2805 McGaw Ave.
P.O. Box 19539
Irvine, CA 92713-9539

Global Engineering sells indexes of military specifications (by contract with the Federal Government), indexed both alphabetically and number - the alphabetic listing sells for \$100.00 (1990). Another way of obtaining a subject index of military specifications is to contact:

Naval Publications and Forms
Commanding Officer
5801 Tabor Ave.
Philadelphia PA 19120

INTIME Data Bank Services
Society of Manufacturing Engineers
(313)271-1500: ask for information on INTIME

INTIME (INformation on Technology In Manufacturing Engineering) is a computerized record of every technical paper, book and periodical published by SME - comprising over 13,000 entries. INTIME is available for both members and non-members (at a slightly increased rate) of SME. An INTIME search will provide the author's name, his or her affiliation, page length, source, and a reference number by which the complete document may be ordered from SME.

INTIME has available a list of published searches consisting of article or paper title, source, author, year of publication, and a concise abstract. Relevant subjects for which searches have been compiled include:

Title	Order Code
Annealing and Heat Treating	910-0932
Machining Centers	913-0932
Gaging	914-0932

Jigs and Fixtures	921-0932
Debburing Applications	922-0932
Grinding Wheels and Dressings	925-0932
Electrical Discharge Machining	1062-0932
Cutting Tools: Geometry	1064-0932
Cutting Tools: Materials	1065-0932

Each search costs approximately \$35.00 (1990)

Manufacturing Technology Information Analysis Center
(MTIAC)
10 W. 35 Street
Chicago, Illinois 60616
312-567-4730

MTIAC provides collection, analysis and dissemination of information on manufacturing technology, including metals, CAD/CAM, inspection and testing on-line through its MTP (Manufacturing Technology Projects) database. Services that are available to the manufacturing technology community include a Current Awareness Bulletin, available free upon request. Published quarterly, this document lists future manufacturing technology symposia, provides summaries of the initiation of new programs, offers critiques of significant newly-acquired reports, journal articles or books.

For information concerning MTIAC's services, request their bulletin Products and Services.

Materials Information
ASM International
Metals Park, OH 44073
216-338-5151

The materials Information department of ASM International provides an abstracting service which is available in hard copy as Metals Abstracts or (from 1966 to present) on-line as METADEX. Metals Abstracts is a monthly journal that contains more than three thousand summaries per issue. Each entry gives a two-hundred or so word abstract, with full bibliographic citations. Metals Abstracts coverage includes periodicals from 43 countries. Abrasive Engineering, Cutting Tool Engineering, Machine Tool and Blue Book, Manufacturing Engineering, and Tooling and Production are indexed. The database may be accessed via DIALOG file 32. A separate Metals Abstracts Index is published to facilitate retrospective literature searches in Metals Abstracts.

ASM publishes ten digests which are subject divisions of Metals Abstracts, and may be subscribed to at a much cheaper rate than the entire Metals Abstracts. These digests are also published monthly, and include:

Cutting Tool/Machining Digest

Heat Processing Digest

Stainless Steels Digest

Testing and Control Digest

Corrosion Prevention/Inhibition Digest

Welding/Brazing/Soldering Digest

Metalforming Digest

Casting Digest

Cleaning/Finishing/Coating Digest

Titanium Digest

A Typical edition of Cutting Tool/Machining Digest will contain over 100 abstracts on the subject of machining and cutting tools, most of which are in English.

Materials Information runs its own photocopy services, as well as a translating service, and will provide complete copies of most of the documents abstracted in the various digests comprising Metals Abstracts.

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
703-487-4600

NTIS, an agency of the Dept. of Commerce, is "the central source for the public sale of U.S. Government-sponsored research, development, and engineering reports." NTIS offers many services, including an Index to Government Reports Announcements (GRA&I). NTIS publishes Tech Notes, which are fact sheets on the results of new applied technology (of ten possible subject areas, the two that are relevant to this study are manufacturing, and machinery and tools). For further information write to the above address and ask for brochure PR-365. NTIS also provides Abstract Newsletters, an abstracting service whose subjects are divided into

approximately 30 topics. Of interest here are the Manufacturing Technology Abstracts. For more information ask for bulletin PR-205. NTIS offers a series of published searches which draw information from 21 data bases, among which are NTIS's own as well as ISMEC (information services in mechanical engineering) and METADEX (Metals Abstracts, produced by ASM).

A yearly 300 pp. booklet entitled Published Searches Master Catalog is available free of charge from NTIS, which lists all the searches available for sale for that year. The cost per search is about \$40.00 (1989). The following is a sample of subject areas for which NTIS has published searches for sale, as listed in the 1988 catalog:

Abrasive Cleaning of Metal Surfaces

Abrasive Grinding Wheels

Abrasive Grinding Wheels

Automation: Machine Tool Technology

Cemented Carbide Metal Cutting Tools

Machining with Ceramic Tools

Computer Aided Manufacture

Coatings for Metal Cutting Tools

Diamond Use in Grinding, Drilling and Machining

Face Milling: Surface Finish and Tool Life

Jet Cutting: High Pressure

Laser Cutting and Machining

Waterjet Cutting

Metal Cutting: Factors Affecting Tool Life

Cutting Fluids for Grinding, Milling and Machining

Cutting Fluids: Lubrication, Heat Transfer and Corrosion

Electrochemical Machining

Grinding Wheels

Machine Tools

Manufacturing

Numerical Control

U.M.I. Article Clearinghouse

University Microfilms International
300 N. Zeeb Road, Ann Arbor, MI 48106
800-521-0600

The UMI Article Clearinghouse was developed in 1983, with the intention of providing a primary source of article photocopies. At present over 11,000 periodicals, conference proceedings, newspapers and government documents are indexed. UMIAC provides a 48-hour turnaround for all articles published within the last five years, with an article price of approximately \$11.00. UMIAC may also be accessed via DIALOG or BRS database systems.

Of the periodicals listed in Chapter I above, the following are indexed by UMIAC:

American Machinist (from 1877); Cutting Tool Engineering (from 1978); Machine and Tool Blue Book (from 1906); Manufacturing Engineering (from 1975); Modern Machine Shop (from 1928); Tooling and Production (from 1934).

For detailed information on services provided by the Article Clearinghouse, write to the above address and ask for the yearly Article Clearinghouse Catalog. This publication lists all periodicals indexed and gives detailed instructions on how to order articles or full issues of periodicals.

CHAPTER 7. MISCELLANEOUS RESOURCES

Comprehensive Machining Information Sources

Machining Data Handbook 3rd Ed.
2 Vols., 2,304 pp. Hardbound, 1980
ISBN 0-936947-00-1

Machinability Data Center
Metcut Research Associates, Inc.
3980 Rosslyn Drive
Cincinnati, OH 45209

Metcut Research's (see Chapter 2) Machining Data Handbook offers the most comprehensive set of tables of speeds and feeds for the machining of different materials. Vol. I is divided into six sections: Turning; Milling; Drilling, Boring, and Operations on Holes; Tapping Operations; Planing and Broaching; Sawing and Cutoff Operations. This volume lists appropriate speeds, feeds and depths of cut for thousands of ferrous and non-ferrous alloys.

Volume II is divided into some 22 sections, each dealing with various machining-related subjects. These include: gear cutting; grinding operations; intro. to non-traditional machining operations; a section each on mechanical, electrical, thermal, and chemical non-traditional machining operations; tool Materials; tool Geometry; cutting fluids; power and force requirements; surface technology; machining guidelines; grinding and abrasive machining; economics in machining and grinding; machine chatter and vibration; NC machining; CAM technologies; machining standards; materials index; glossary. The Handbook includes a subject index.

MDC issues several pertinent short length soft-bound books:

Machining: A Process Checklist 28pp. 1978

Chemical Machining: Production with Chemistry 76pp. 1977

MDC Manufacturing Systems Report: Group Technology: An Overview and Bibliography 92pp.(480 references)

Non-Traditional Machining Guide 76pp.

Low Stress Grinding for Quality Production 112pp.

Machinery's Handbook

Oberg, Jones, Horton 23rd ed. 2,500pp 1988 ISBN 0-8311-1200-X

Industrial Press
Dept. 8800
200 Madison Ave.
New York, NY 10016

The 23rd edition of this handbook marks the 75th year of continual printing. Topics in the Handbook include math; mechanics; strength of materials; testing; dimensioning; gaging; tooling and tool making; machining operations; manufacturing processes; fasteners; threads and threading; gears; splines and cams; bearings and other machine elements; measuring units.

Metal Cutting Tool Handbook

United States Cutting Tool Institute
900 pp. 1988, ISBN 0-8311-1177-1
Industrial Press
200 Madison Ave.
New York, NY 10016

This handbook limits its subject area to cutting tool processes. Topics include drilling; reaming; counterboring; taps and dies; milling cutters; hobs; gear shaper cutters; gear shaving cutters; engineering data section.

Metals Handbook

9th Ed. Volume 16: Machining 1989 ISBN: 087170-022-0

ASM International
Metals Park, Ohio 44073

ASM's 500-page volume on machining is divided into the following sections: Machining Processes and Their Application to Steel and Cast Iron; Materials for Cutting Tools; Machining of Cast Iron; Machining and Grinding of Tool Steel; Machining of Stainless Steel and Heat-Resisting Alloys;

Machining of Non-Ferrous Metals. Within these sections virtually all of the traditional machining methods are discussed, along with many non-traditional ones such as electrical discharge machining, electrochemical machining, chemical machining, ultrasonic machining, abrasive jet machining, electron beam machining, laser beam machining, plasma arc machining, electrical discharge grinding, etc.

The book is written from a practical point of view; contributors are from industry rather than engineering labs, and examples of industrial applications of machining processes abound. Relatively few equations and formulae are presented. Extensive use is made of sketches and diagrams to aid in understanding the processes under discussion.

The New American Machinist's Handbook

Edited by Rupert Le Grand, senior editor, American Machinist
McGraw-Hill, New York, 1955
1221 Avenue of the Americas
New York, NY 10020

This classic handbook will be reprinted in 1989, though not in a revised edition. Apparently McGraw-Hill feels that there will be enough demand for book as it has been printed since 1955. Almost one-half of the book (about 300 pages) is devoted to machining, being divided into 13 sections: Broaches and Broaching; Drills and Drilling; Files and Burrs; Gears, Splines and Serrations; Grinding, Honing, Lapping and Superfinishing; Milling and Milling Cutters; Planing and Shaping; Reamers and Reaming; Saws and Sawing; Threading Processes and Thread Systems; Taps and Tapping; Turning and Boring; Screw-Machine Work. Other parts of the handbook deal with metal-forming methods, assembly methods, materials, finishing of metals, inspection, fastening devices, tool engineering and drafting practice, machine-tool standards, power-transmission equipment, and mathematics and tables.

The handbook contains a tremendous amount of machining information in a very accessible format. Emphasis is on practicality of subject matter. Of course any handbook must be continually revised to be up to date, but the subject matter included in this work is surprisingly relevant today.

Tool and Manufacturing Engineers Handbook

Vol. I Machining

Edited by T. Drozda, C. Wick

ISBN: 0-87263-085-4

Society of Manufacturing Engineers
One SME Drive, P.O. Box 930
Dearborn, MI 48121-0930

This volume, one of five published by SME, deals exclusively with principles and practices of machining. At 1,484 pp., it is one of the most comprehensive sources of machining information available. Chapter headings include: Principles of Metalcutting and Machinability; Tolerance Control; Cutting Tool Materials; Cutting Fluids and Lubricants; Machine Controls; Sawing; Broaching, Planing, Shaping, Slotting; Turning and Boring; Drilling Reaming and Related Processes; Milling; Grinding; Threading; Gear and Spline Production; Nontraditional Machining; Multifunction Machines; Machine Loading and Unloading; Machine Rebuilding; Safety and Noise Control.

Selected ANSI Standards

ANSI Standards may be obtained from:

ANSI Sales Dept.

1430 Broadway

New York, NY 10018

ANSI No.	Title
B3-85	Control Chart Method of Controlling Quality During Production
B1.1-82	Unified Inch Screw Threads
B1.1-83	Gages and Gaging for Unified Screw Threads
B1.3M-86	Screw Thread Gaging Systems for Dimensional Acceptability
B1.7M-84	Nomenclature for Screw Threads
B1.8-88	Stub Acme Screw Threads
B1.9-73	Buttress Inch Screw Threads
B1.10-58	Unified Miniature Screw Threads
B1.11-58	Microscope Objective Screw Threads
B1.12-87	Class 5 Interference-Fit Thread
B1.20-1.83	Pipe Threads, General Purpose
B4.1-67	Preferred Limits and Fits for Cylindrical Parts
B5.1M-85	T-Slots, Their Bolts and Nuts
B5.8-72	Chucks and Chuck Jaws
B5.9-67	Spindle Noses for Engine Lathes
B5.10-81	Machine Tapers
B5.16-52	Accuracy of Engine and Tool-Room Lathes
B5.18-72	Spindle Noses and Tool Shanks for Milling Machines
B5.32-77	Grinding Machines, Surface
B5.45-72	Milling Machines

B5.45-72 Milling Machine Arbor Assemblies
B5.48-77 Ball Screws
B5.53M-82 Tool and Cutter Grinding Machines
B7.1-78 Abrasive Wheel Safety
B17.1-67 Keys and Keyseats
B17.2-67 Woodruff Keys and Keyseats
B46.1-85 Surface Texture
B74.2-82 Shapes and Sizes of Grinding Wheels
B89.1.9M-84 Gage Blocks
B89.1.10M-87 Dial Indicators
B89.3.1-72 Measuring Out-Of-Roundness
B94.2-83 Reamers
B94.3-85 Cut-Off Blades for Lathes
B94.5-74 Carbide Blanks and Single Point Brazed Tools
B94.6-84 Knurling
B94.9-79 Taps
B94.11M-79 Twist Drills
B94.49-75 Spade Drills
B94.50-75 Nomenclature for Single-Point Cutting Tools
B94.51M-84 Specifications for Band-Saw Blades
B94.54-84 Specifications for Hole Saws
B94.55M-85 Tool Life Testing with Single Point Turning Tools
X3.37-1987 APT Language Standards
Y14.5M-82 Geometric Dimensioning and Tolerancing

Selected Military Specifications/Standards

Individual military specifications may be obtained from:
Global Engineering
2805 McGaw Ave.
P.O. Box 19539
Irvine, CA 92713-9539

Also available from Global is the Department of Defense Index of Specifications and Standards. Part I of this work is an alphabetical listing; part II is a numerical listing. These indexes are also available from:

Commanding Officer
Naval Publications and Forms Center (attn: NPODS)
5801 Tabor Ave.
Philadelphia, PA 19120

The indexes are also to be found in the documents section of many university libraries.

Boring and Milling Machines, Precision, Horizontal Spindle, Table Type, Manually or NC: MIL-B-80004C

Boring and Turning Machines, Vertical, CNC, Perforated Tape
MIL-B-80202A

Boring and Turning Machines, Vertical, NC by Manual Data Input, 36-96 Inch Tables MIL-B-80248A

Boring and Turning Machines, Vertical, and Lathes, Vertical, Turret, Manual MIL-B-14154D

Boring Machines, Vertical, Single Column, CNC MIL-B-80210B

Boring Machines, Jig, Vertical Double Column, Bridge Type, Fixed or Travelling Cross Rail, NC MIL-B-80272

Boring Machines, Jig, Vertical, Single and Double Column Bridge Types, Manual and Power Feed MIL-B-9925D

Boring, Milling and Drilling Machines, Horizontal Table Type, 4, 5, and 6 Inch Spindle MIL-B-45544D

Cutting Fluid, Emulsifiable Oils VV-C-846A

Cutting Fluid, Sulphur and Chlorine-additive MIL-C-46149

Cutting Fluid, Sulfurized Fatty and Mineral Oils VV-C-850A

Cutter Bit Blanks and Cut-off Blades A-A-51130

Cutter Bit, Tool Holder (Carbide Type) A-A-51143

Cutter Bit, Tool Holder (solid HSS) 00-C-851A

Drilling Machine, Radial, Floor Mounted MIL-D-80262A

Drilling Machine, Upright, Box Column, Floor, Plain Table, Hand Feed MIL-D-80076B

Drilling Machine, Radial, Bench Type, Sliding Arm, Swivel Head, Hand Feed MIL-D-45815D

Drilling Machine, Upright, Sensitive, Bench Type, Single Spindle, 5/16 Inch and Under, Hand Feed MIL-D-18072D

Drilling Machine, Upright, Floor Type, Round and Box Column, Sliding Head, Plain Table, Power Feed MIL-D-80002D

Drilling Machine, Upright, Turret Head, Sliding Carrier, Six Spindles, Bench Mounted MIL-D-80150B

Grinding Machine, Internal, Planetary Head, Horizontal Spindle, Electric Motor Driven MIL-G-80228A

Grinding Machine, External, Center Type, Universal, Travelling Table MIL-G-23823D

Grinding Machine, Cylindrical, External, Plain, Power MIL-G-23368C

Grinding Machine, Jig, Vertical MIL-G-23681C

Grinding Machine, Tool and Cutter, and Grinding and Gashing Machines, Tool, Cutter, Flute and Radius 00-G-692C

Grinding Machine, Non-Traversing Rotary Table, Vertical Spindle, Universal, Manual, Automatic, and CNC MIL-G-80239B

Grinding Machine, Tool and Cutter, Flute and Radius, CNC Controlled MIL-G-80266A

Grinding Machine, Jig, Vertical, CNC MIL-G-80267

Grinding Machine, Thread, External, Automatic MIL-G-80162A

Grinding Machine, Rotary Table, Horizontal Spindle MIL-G-80163A

Grinding Machine, Surface, Reciprocating Table, Horizontal Spindle, Hand Feed MIL-G-80145B

Grinding Machine, Centerless, External, Cylindrical
MIL-G-80048C

Grinding Machine, Surface, Rotary, Vertical Spindle, Single
Table MIL-G-80125B

Grinding Machine, Carbide Tool Bit and Carbide Tool Bit
Chipbreaker Combination, Electric Motor Driven MIL-G-80025C

Grinding Machine, Surface, Reciprocating Table, Horizontal
Spindle, Power Feed MIL-G-80088D

Lathe, Bench, Variable Speed, Plain and Turret; 9-inch
MIL-L-80061B

Lathe, Engine and Tool Room, 19,20,25 Inch, 7 1/2 to 15HP
MIL-L-23400E

Lathe, Engine, 9 by 22 Inch, Bench Type MIL-L-11285D

Lathe, Engine and Tool Room 13 through 17 inch MIL-L-23249D

Lathe, Engine and Toolroom, 10 inch 00-L-125D

Lathe, Engine and Toolroom, 2516 and 3220 MIL-L-23251D

Lathe, Engine, 28-inch Swing MIL-L-45958A

Lathe, Engine, 18-inch Swing MIL-L-45943B

Lathe, Engine, 13-Inch Swing, Cabinet Base MIL-L-45990

Lathe, Multiple Purpose, Chucking, Horizontal Spindle, CNC
Controlled MIL-L-80245A

Lathe, Precision, Instrument MIL-L-23225C

Lathe, Speed, Horizontal Spindle, Single End, Bench and Floor
Mounted MIL-L-80175B

Lathe, Turret, Horizontal, Universal, Ram Type MIL-L-4533F

Lathe, Turret, Horizontal, Vertical Bed and Slant Bed, NC
Controlled MIL-L-80219A

Lathe, Engine and Toolroom, 1609 and 2012 MIL-L-23257D

Lathe, Engine, Gap, Sliding Bed and Removable Block
MIL-L-13896E

Lathe, Toolroom, Variable Speed, 11-Inch MIL-L-80007D

Lathe, Turret, Horizontal, CNC MIL-L-80053C

Lathe, Turret, Horizontal Bar and Chucking, 1 3/4 Inch Bar Capacity, CNC MIL-L-80257

Machining Centers, Vertical, Single Spindle, Double Column, CNC MIL-M-80269

Machining Centers, Horizontal, Single Spindle, 4 and 5 axis, Softwired NC MIL-M-80263

Machining Center, Horizontal, Single Spindle 3 Axis, Softwired NC, with Positioning Rotary Table MIL-M-80264

Machining Centers, Vertical, Single Spindle, CNC MIL-M-80255A

Milling Machine, Horizontal Profilers, Traveling Table Type, Three Axes, CNC, Single and Multi Spindle MIL-M-80204B

Milling Machine, Horizontal, Universal, MIL-M-13934E

Milling Machine, Bed Type, Horizontal Spindle, Automatic Cycle, 24, 26, and 30 inch Minimum Table Width, Plain and Duplex Machines MIL-M-80215

Milling Machine, Swivel Head, Ram Type, Universal MIL-M-45577B

Milling Machine, Combination Horizontal and Vertical, Knee Type MIL-M-80033C

Milling Machine, Vertical Knee Type, 3 Axes, NC 1.5 to 7.5 HP Spindle Drive MIL-M-80209B

Milling Machine, Planer Type, Double Housing MIL-M-80177A

Milling Machine, Bed Type, Vertical, Double Housing, NC Controlled, Profiling, 5 to 25 HP per Spindle, Single and Multiple Spindles MIL-M-80184A

Milling Machine, Vertical, Knee Type, Size 2-7 MIL-M-80016C

Milling Machine, Vertical Spindle, Knee Type, Size 2,3,4, and 5, MIL-M-80051D

Milling Machines, Hydraulic Tracer Controlled, Three Dimensional, Duplicating, Profiling MIL-M-23855C

Milling Machines, Vertical Single and Multiple Spindle, CNC and Tracer Controlled Profiler MIL-M-80212A

Milling Machines, Bench Type, Horizontal, Vertical, Geared,
General Purpose 00-M-59C

Milling Machines, Bed Type, Ram or Column Mounted Vertical
Spindle, Electronic Tracer Controlled, Profiling and Duplica-
ting MIL-M-80127B

Milling Machines, Horizontal Spindle, Knee Type, Sizes 2,3,4
and 5 MIL-M-80044D

Milling, Grinding, Drilling, Slotting Attachment 00-M-340D

Saw, Band, Metal Cutting MIL-S-40601D

Saw, Band, Metal Cutting, 14 inch MIL-S-1387SF

Saws, Band, Cutoff, Tilting, Travelling, Vertical Column
MIL-S-24035B

Saw, Band, Metal Cutting, Vertical, Contour MIL-S-80201B

Saws, Band, Metal Cutting, Contour, Power Feeding Table, 19,
26,35, and 60 Inch Throat Widths MIL-S-24034E

Seminars/Classes/Instruction Available

Irregular course offerings:

General Electric Company
Mr. E Ratterman, Manager,
Applications Technology Communication Systems,
Specialty Materials Department,
General Electric Company,
6325 Huntley Road,
Worthington, Ohio 43085

In August 1987, the Superabrasive Institute of General Electric conducted a 5-day course designed to acquaint community college instructors on the use of the superabrasive CBN (cubic boron nitride). The course consisted of 27 hours of theory and laboratory time, for a duration of five days.

Contact personnel listed above for future courses on this subject. An article on this course appears in the spring, 1989 issue of Technical Education News.

Industrial Engineering Department
LeHigh University
Bethlehem, PA 18015
215-758-4050

The Industrial Engineering Department has offered a three-day workshop seminar in the selection, use and preparation of material removal cutting tools. The course contents included: influence of element composition of various cutting tool materials; measurement and improvement of machinability; in-process methods of optimizing machining conditions; effect of cutting tool geometry; identifying modes of tool failure; laboratory demonstrations of process variables; selection of cutting fluids.

Regular Course Offerings

Acme Institute of Technology
504 West Calvert Street
P.O. Box 2708
South Bend, Indiana 46680

The Acme Institute of Technology offers four correspondence courses each in the areas of tool design; Die Design; and Plastic Mold Design. Founded in 1935, the school is accredited by the National Association of Trade and Technical Schools.

American Society for Metals
(see Chapter 2)

ASM provides various home study courses in areas related to metal processing, including heat treating. See ASM, Chapter 2.

Brown & Sharpe Manufacturing Company
Precision Park, North Kingstown,
Rhode Island 02852
401-886-2800

Brown and Sharp offer a series of courses dealing with screw machines, including:

Screw Machine Training and Setup Course

CNC Ultramatic Setup and Operation Course

CNC Ultramatic Maintenance Course

Screw Machine Engineering Course

Screw Machine Maintenance Course

Metcut Research Associates Inc.
Manufacturing Technology Division
11240 Cornell Park Drive
Cincinnati, Ohio 45242
513-489-6688

Metcut Research Associates offers a two-day course of instruction "Practical Machining Principles for Shop Application". The course is held approximately every two weeks. The course covers chip formation, tool material selection, cutting fluids, machinability, incoming material qualification, factors affecting machining speeds and feeds, affects of machine and cutting tool rigidity, factors affecting machining cost and production rate, how to increase service life and prevent damage to machined parts, when to use NC, new manufacturing techniques.

National Tooling and Machining Association
(see Chapter 2.)

The NTMA operates eleven regional training centers throughout

the U.S. For a complete list of addresses, obtain their catalog Publications and Training Materials.

One training center is in Santa Clara, California, close to silicon valley. This center provides a machinist apprenticeship training facility; a CNC "retraining program"; an entry-level training program for young unemployed people (the program is government-funded for qualified candidates); and a free CNC training course offered to "experienced machinists who need to attain proficiency in NC/CNC operations"

Rank Teller Hobson
411 East Jarvis Ave.
Des Plaines, Illinois 60018
312-297-7720

Rank Teller Hobson offers a one-day seminar in basic and advanced metrology. Each year (from November to November) a series of approximately eight sessions is scheduled at different locations around the U.S. Included in the curriculum are optical metrology and surface measurement.

TPC Training Systems
700 Eastwood Lane
Buffalo Grove, IL 60089
312-537-6610

One of the 26 self-supervised training programs that TCP offers is machine shop practices. TCP programs are purchased by both private corporations and non-profit institutes of learning. Each Manual for a unit listed below lists for about \$30.00.

The machine shop practices program is divided into units, which in turn are subdivided into lessons. Each text-based lesson is about two hours in length. TPC's 1988-1989 Training Catalog shows the organizational content of the program as follows:

Machine Shop Practice

Principles of Machining; Layout Work and Shop Safety;
Setup Tools; Setup Measurement; How to Grind Single
Point Tools; How To Grind Multi-Point Tools

Machine Shop Turning Operations

Lathes and Attachments; Basic Lathe Operations;
Drilling and Boring; Reaming; Threads and Threading

Machine Shop Shaping Operations

Milling Operations; Shaping and Planing;
Grinding Operations; Gear Cutting; Power Sawing

Machine Shop Job Analysis

Machining Cylindrical Shapes; Drilling, Reaming and
Honing; Machining Flat Surfaces; Determining Tolerances
and Finishes; Variables Affecting Job Efficiency;

How to Turn Work Between Centers on the Lathe

Lathe Setup and Workpiece Preparation;
Rough and Finish Turning; Shouldering, Knurling, and
Notching; Cutting External Threads; Turning Tapers
Between Centers

How to Machine Work Held in a Chuck on the Lathe

Lathe Setup and Workpiece Preparation; Rough Turning and
Finish Turning; Boring and Counterboring;
Cutting Internal Threads and Boring Tapers;
Holding Irregular and Oversize Workpieces;

Using Basic Milling Procedures

Using the Horizontal Milling Machine; Slab Milling
Procedures; Milling Slots and Angles;
Straddle, Side, and Face Milling; Milling Keyseats,
Square, and Flats

Using Indexed Milling Procedures

Using the Dividing Head; Dividing Head Setup
Milling Spur Gears; Helical Milling; Milling Cams

Multiple-Machine Procedures and Shop Projects

Power Sawing; Drilling Operations; Operating a
Horizontal Shaper; Grinding Operations; Boring Mill
Operations

CHAPTER 8. RESOURCES PREPARED FOR THE INSTRUCTOR

Periodicals

Several periodicals exist which contain interesting articles and information concerning new teaching aids, seminars, directories, instruction and conferences for instructors of vocational/technical education. Four periodicals of this type are listed below.

Industrial Education

"serving vocational technical educators since 1914"

Cummins Publishing Company
26011 Evergreen Street
Southfield, Michigan 48076
313-358-4900
ISSN 0091-8601

Industrial Education is published monthly, except in June, July and August. The periodical includes approximately eight feature articles dealing with diverse subjects related to industrial processes and instruction methods. Regular departments include "As We See It", an editorial; "School Market News", a review of new research developments, curriculum guides, grant opportunities, software, etc.; "Updates in Education", a department which focuses on new developments within educational institutions; New Literature; Product Highlights; Product Guide. There are many advertisements showing new teaching aids throughout the periodical.

The Journal of Industrial Technology

National Association of Industrial Technology (see Organizations, this Appendix)
150 Sill Hall, College of Technology
Eastern Michigan University
Ypsilanti, MI 48197
313-487-0358
ISSN 0882-6404

The Journal of Industrial Technology is published quarterly. Articles submitted for publication by this

journal are written for educators, students, graduates of industrial technology programs, industrial representatives, and others interested in industrial technology. This is an important periodical to ascertain what faculty positions are currently available.

School Shop

"The Magazine for Industrial, Technical and Vocational Educators"

Prakken Publications, Inc.
416 Longshore Drive,
P.O. Box 8623
Ann Arbor, Michigan 48107
313-769-1211
ISSN 0036-682X

School Shop is published monthly except June and July. Feature articles in this periodical are really diverse, covering new teaching methods and aids. Regular departments include "School Shop Talk", an editorial; "News", "People", "Calendar", a listing of conferences and seminars; "Learning Resources", new publications and software; "Shop Kinks", tricks of the trade, "Letters"; "Technology's Past", short articles on the history of technology, "Industrial Mathematics", examples of appropriate math problems for students; "Product News"; "Product Literature". Since 1941

Each September this periodical offers a directory of state and federal officials in vocational and industrial education.

Technical Education News

McGraw-Hill
8171 Redwood Highway
Novato, CA 94945

Technical Education News is published during the school year by McGraw-Hill, and is available free of charge to technical and occupational educators. Though the periodical serves as an advertising forum for McGraw-Hill products, there are many articles of interest to instructors of technical subjects. In this periodical one may learn of General Electric's course on superabrasives, as presented to community college instructors. Since 1941.

Vocational Education Journal

American Vocational Association
1410 King Street
Alexandria, VA 22314
(707) 683-3111
ISSN 0884-8009

The Vocational Education Journal, published monthly with combined Nov. Dec. and Jan. Feb. issues, is sent to all members of the American Vocational Association. Subscriptions may be obtained by non-members for a fee.

This periodical focuses on the relationship between the vocational/technical training institution and the nature of the technical work environment. A short list of topics from the October 1989 issue includes; "What People Don't Know About Metalcasting Opportunities"; "Labor-Intensive Food Service Needs 11 Million Workers ..."; "Great Opportunities Await Machinists"; "...Demand for Health Care Workers....".

There is quite a bit of advertising per issue dealing with curriculum-related software and hardware.

Associations

Within the last decade associations among schools and industry have been formed in an effort to provide marketable skills in the area of high-tech manufacturing. The activities of these organizations have to do with establishing databases of expertise and curriculum materials, forming links with manufacturing industries, labor, legislators on local, state and federal levels, and in general preventing redundant efforts in the creation of curriculum resources. The Alliance for Manufacturing Progress, and the Consortium for Manufacturing Competitiveness are typical. A similar organization is the Machine Action Project (contact Bob Forants, Springfield, Mass 413-781-6900).

Alliance for Manufacturing Progress
Autodesk Inc.
2320 Marinship Way
Sausalito, CA 94965
Contact: Karen Alesch

The Alliance for Manufacturing Progress (AMP) was organized by Autodesk (developers of Autocad software) in 1987. Its

purpose is "To demonstrate that two-year, post-secondary technical institutions are ideally positioned to effect the transfer of manufacturing technology into industry." The alliance strives to maintain a strong commitment to serving small manufacturing firms. More than 20 companies in addition to Autodesk participate in AMP; approximately 22 two-year colleges are involved throughout the U.S., with new recruitment of about five colleges per year. AMP is currently establishing a "database of expertise" whereby instructors may locate knowledgeable personnel in specific areas of manufacturing technology.

American Technical Education Association
North Dakota State College of Science
Wahpeton, ND 58076
701-671-2240

The American Technical Education Association was founded in 1928. Members are from colleges, institutes, universities, technical institutes, area vocational schools, and other schools offering technical programs. The objectives of the Association are to promote technical education; to establish standards for technical education; provide an opportunity for exchange of ideas among persons in technical education, industry, and business; involve local, state, and national legislators in ATEA.

This year (1990) ATEA is holding its 27th National Conference on Technical Education at the Sheraton Century Hotel and Towers, Oklahoma City, OK : March 29 - April 1.

American Vocational Association
1410 King Street
Alexandria, VA 22314
703-683-3111

The AVA is a national association with a membership of 45,000. Its purpose is to provide a communication network for professionals in vocational education. It does so through the publication of its periodicals Vocational Education Journal, and Update, an association newsletter.

The AVA publications catalog offers material dealing with the theory of voc. ed., assesment of students with handicaps, marketing voc. ed., administration, career development, curriculum, future trends, teacher resources, and teaching. The publications catalog is available to non-members free of charge. The AVA holds regional conferences,

conducts an annual convention, sponsors National Vocational Education Week, and offers various insurance programs to its members.

International Technology Education Association
1914 Association Drive
Reston, VA 22091

The ITEA is an international organization whose aim is to promote technology education both in the U.S. and abroad. ITEA publishes a journal The Technology Teacher eight times per year. Much of the subject content of the journal is not directed to post-secondary education. ITEA holds an annual conference and trade show; in 1990 it will be held in Orlando, Florida, April 2-5. The program will include workshops (on curriculum design, design and problem solving, among other subjects); tours, and activity labs as well as numerous meetings.

The 1989-1990 ITEA Catalog lists "resources for technology education teachers, supervisors and educators".

Affiliated with the ITEA is the CITEA, the California Industrial and Technology Education Association.
3453 Ramona Ave., Suite 11, Sacramento, CA 96826

National Association of Industrial Technology
150 Sill Hall
Eastern Michigan University
Ypsilanti, MI 48197
313-487-0358

The National Association of Industrial Technology exists to foster the improvement of industrial technology within colleges, universities, business and industry. To this end, NAIT provides an accreditation process for recognizing the attainment of appropriate standards for industrial technology programs in colleges and universities. One of NAIT's purposes is to disseminate information concerning industrial technology through the publication of its periodical Journal of Industrial Technology (see periodicals, above). NAIT also publishes a Baccalaureate Program Directory, a directory of programs, personnel, institutions, degree information, accredited schools, and NAIT members.

NAIT convenes annually; 1989 will be the twenty-second annual convention, lasting three days. Proceedings will include many speakers on subjects ranging from "integrating

management concepts in industrial technology courses", to "comparative machining of heatsinks at spindle speeds from 1,500 to 30,000 rpm".

The Consortium for Manufacturing Competitiveness
P.O. Box 12293
Research Triangle Park
North Carolina 27709
919-941-5145
Contact: Stuart Rosenfeld

The CMC is a project initiated in 1988 by the Southern Technology Council, a newly formed public/private advisory body to the Southern Growth Policies Board, which geographically includes Florida, North and South Carolina, Virginia, West Virginia, Kentucky, Tennessee, Oklahoma, Arkansas, Louisiana, Missouri, Georgia, and Alabama. The functions of CMC are based upon the assumption the two-year community college is the institution best suited for upgrading technical skills in the area of high-tech manufacturing.

CMC publishes a newsletter, Technogram, which relates newsworthy events. A 32 pp. bulletin Technical and Community Colleges Leading The Way Into The Nineties: The Consortium for Manufacturing Competitiveness, is ideal for learning about the activities and concerns of CMC.

Vocational Industrial Clubs of America

P.O. Box 3000
Leesburg, VA 22075
703-777-8810

VICA, founded in 1965, is a non-profit national organization of trade, industrial and health occupations students in public high schools, community colleges and skills centers. At present the membership exceeds 250,000. The purposes of the organization are to establish links between business, labor, government, educators and students to improve the quality and relevancy of voc. ed. instruction.

Among VICA's numerous activities is the sponsorship of a trade and technical education exposition. The 1990 "TECHSPRO" will be held in Tulsa, Oklahoma, June 28. Displays of CAD, CAM, and precision machining will be among the exhibits.

Information Systems and Services: Non-Commercial Resources

There are considerable non-commercial resources funded at the state level which have to do with some aspect of machine shop instruction. Some of these resources are accessed via the databases listed below. Accessing this material efficiently poses real problems, since no single comprehensive database covers the area, and there are no current bibliographies available at this time.

What kinds of non-commercial materials are available which might be of help to the instructors? In general, instructor's guides, course outlines, texts, employability profiles, task analyses, information for establishing competency-based voc. ed. programs, individualized instruction programs (learning activity packets, or LAPs), curriculum materials both written and visual, and programming manuals.

Educational Resources Information Center (ERIC)

ERIC is an organization within the Division of Information Technology and Dissemination, which is under the Department of Education. Information in ERIC is compiled in two indexes: Resources in Education (RIE), a monthly abstract journal announcing recent research reports, conference papers, bibliographies, innovative practice reports, curriculum guides, literature reviews, and other literature related to education; Current Index to Journals in Education (CIJE) indexes periodical literature in the field of education.

Subjects in ERIC are searched through the use of appropriate "descriptors" - subject headings. Since ERIC may be accessed on-line via DIALOG or BRS, this is a convenient way to ascertain what literature exists that may be of interest. An ERIC search via DIALOG was conducted by the writer on July 7, 1989, using the descriptors "machine tools", "machine tool operators", "machinists", "manufacturing industry", "machinery and equipment" (since this is the ERIC database, it is taken for granted that entries retrieved will have something to do with education). The search was limited to "postsecondary education, or higher education", and encompassed the years 1980 to 1989. 160 bibliographic entries were retrieved, approximately half of which, due to the general nature of the descriptors employed above, were not relevant. At the end of this chapter there is a bibliography, compiled in part by entries from ERIC. The ED number preceding each entry allows the reader to retrieve and/or view the document. Many university libraries have full-text ERIC microfiches available, which may be copied on paper, but

a cheaper way (\$2. per 20 pp., 1989) to obtain hard copies of ERIC documents is to contact:

Eric Document Reproduction Service
3900 Wheeler Avenue,
Alexandria, VA 22304-6409
800-227-3742

A useful if somewhat dated accompaniment to the ERIC index is the book An Annotated Bibliography of ERIC Bibliographies, 1966-1980, compiled by Joseph Gerald Drazan, Greenwood Press, Westport, Connecticut. Several sample bibliographies listed in this book include (listed in the same format in which they appear in the text):

Hinrichs, Roy S and Gary A. Stone. Resource information for industrial arts. State College, Mississippi Research and Curriculum Unit for Vocational and Technical Education, 1976. 42p. ED 127435 Includes 350 books, journals, films, and catalogs recommended for starting an industrial arts library.

Jelden, David L. Summaries of studies in industrial arts, trade and industrial, and technical education from 1930. Washington, DC, American Council on Industrial Arts Teacher Education, 1970. 969p. ED 037583962 abstracts of dissertations and staff studies are included. ED 062560 is a 514 page supplement with more than 400 abstracts, and ED 076846 is a 463 pp. supplement with 366 additional abstracts.

Vocational Education Curriculum Materials (VECM)
Graduate School of Education
1501 Tolman Hall
University of California
Berkeley, CA 94720
415-643-6626

The VECM database contains records of current print and non-print vocational and technical education curriculum materials. Entries may be searched by sponsoring agency, educational level, intended user, and student target population. VECM may be searched free of charge by contacting one of the centers of the National Network for Curriculum Coordination in Vocational and Technical Education (NNCCVTE) (see below), or may be accessed via the BRS database system. There is an overlapping of materials between ERIC and VECM.

For the past 20 years, until 1988, the National Center for Research in Vocational Education, the ERIC Clearinghouse on Adult, Career, and Vocational Education, and the Center on Education and Training for Employment have all been at Ohio

State University. By federal law (Carl Perkins Vocational Education Act) there is a competition every five years to see who will be the recipient of federal grants to fund research in vocational education. Now the National Center for Research in Vocational Education is located at the University of California, Berkeley, and the emphasis of the research at the center will be of a more theoretical nature. What still exists at Ohio is the Center for Education in Training and Employment, which hosts the Eric Clearinghouse on Adult, Career, and Vocational Education:

Center For Education in Training and Employment
Ohio State University
1960 Kenny Road
Columbus Ohio 43210
800-848-4815

It is worthwhile to obtain a free copy of the Center's Products Catalog. The information dispensing role of the Center relies on its association with the Eric Clearinghouse; the catalog draws upon entries in ERIC.

The Catalog of Products and Services includes materials on the subjects of: trends and issues; program innovations; teacher/instructor education; secondary/postsecondary delivery; adult education; career planning; at-risk youth and adults; and linkages, that is, the linking with business, labor, and the community.

The center also dispenses free of charge a recent issue of The Eric File, a 4-page brochure which explains how the ERIC system works, relates new offerings of interest in the field, lists free materials, etc. Also of interest are the pamphlets ERIC No Cost Resources, and ERIC Information Analysis Papers 1986-1989.

National Center For Research in Vocational Education
University of California, Berkeley
2150 Shattuck Avenue, Suite 600
Berkeley, CA 94704-1306
415-642-4004

As mentioned above, 1988 is the first year the NCRVE has been at U.C. Berkeley. To this date, (1989) the list of publications for sale is only one page in length. For a description of the activities of this organization, ask for their The 1989 Agenda for the National Center for Research in Vocational Education. This publication lists research project descriptions and service activities.

National Network for Curriculum Coordination in Vocational
and Technical Education (NNCCVTE)

There are six Curriculum Coordination Centers (CCC's)
throughout the U.S. that together comprise the NNCCVTE.
Listed below are their addresses and the states each center
serves:

Northeast Curriculum Coordination Center
Cambridge Park School
Crest Way
Aberdeen, NJ 97747
201/290-19000

Serving: Main, Vermont, New Hampshire, New York, Massachus-
sets, Connecticut, Rhode Island, New Jersey, and Puerto Rico.

Southeast Curriculum Coordination Center
Mississippi State University
P.O. Drawer DX
Mississippi State, MS 39762
601/325-2510
Serving: Georgia, Florida, Alabama, South Carolina, North
Carolina, Tennessee, and Mississippi.

East Central Curriculum Coordination Center
Sangamon State University, F-2
Springfield, IL 62794-9243
217/789-6375

Serving: Wisconsin, Illinois, Minnesota, Michigan, Indiana,
Ohio, Pennsylvania, West Virginia, Virginia, Delaware, and
Maryland.

Midwest Curriculum Coordination Center
1500 W. 7th Ave.
Stillwater, OK 74074
405/377-2000

Serving: Texas, New Mexico, Louisiana, Oklahoma, Kansas,
Nebraska, Arkansas, Missouri, and Iowa.

The Midwest Curriculum Coordination Center should not be
confused with the Mid-America Vocational Curriculum Consor-
tium, which also resides in Stillwater, OK (1500 West Seventh
Avenue, Stillwater, OK 74074-4364 Tel. 800-654-3988). Mid-
America tries not to duplicate the resources of the Midwest
C.C.C., and thus has no resources at the present time which
are related to machine-tool technology. There are, however,

competency-based vocational instruction materials relating to welding, sheet metal working, blueprint reading, and quite a few other vocational areas.

Northwest Curriculum Coordination Center
Old Main, Room 478
St. Martin's College
Lacey, WA 98503
206/438-4456

Serving: Washington, Oregon, Idaho, Montana, Wyoming, North Dakota, South Dakota, Alaska, Utah, and Colorado.

Western Curriculum Coordination Center
College of Education
University of Hawaii
1776 University Ave.
Wist 216
Honolulu, HI 96822
808/948-7834

Serving: Hawaii, California, Nevada, Arizona, and Pacific U.S. Territories.

The Northwestern Curriculum Coordination Center (NWCCC) provides an example of how these centers operate.

The NWCCC maintains its own vocational curricula data base which contains over 5000 listings entered according to program area. In Addition, the NWCCC subscribes to the BRS database system (see Chapter 6). Via BRS, the VECM (Vocational Educational Curriculum Materials) database may be accessed, which contains over 7000 entries. The VECM database may be accessed on line by any school which subscribes to BRS, but any Curriculum Coordination Center will conduct a search of VECM free of charge, by telephone request.

A search by telephone request by the author to NWCCC, on June 30, 1989, resulted in bibliographic information arriving approximately one week later. The search was for curriculum materials, and employed as key descriptors: "machinist", "metalworking", "tool and die making", "machine operation", and "machine tool technology". This search called up 53 entries from NWCCC's own database. Seven entries dealt with agricultural machine operation, while two entries were military curricula for aviation machinist's mate. Two entries dealt with bilingual curriculum materials, and four entries dealt with sheet metal work. The remaining entries were various curriculum guides for machine shop operations, including heat treating, shop math, apprentice related

training, strength of materials, energy efficiency, metal working hand tools, introduction to mechanical skills, etc.

A search of VECM was also conducted using the same descriptors. (A search request will usually involve NWCCC's database and VECM). "Machinist", "metalworking", "machine tool technology", and "tool and die" called up 16, 7, 7, and 3 documents respectively. Of the 31 entries listed (three entries were triplicates) approximately 25 were relevant here.

The NWCCC loans materials free of charge for a period of 30 days. Copying rights vary from one document to the next, but many documents are free for the borrower to duplicate.

Many relevant materials produced by vocational divisions of state departments of education and university/technical college curriculum development laboratories are not in the holdings of any curriculum coordination center. Here it is worth mentioning a cooperative venture of states that produce curriculum guides and related works, the Vocational-Technical Education Consortium of States (V-TECS):

Vocational-Technical Education Consortium of States
Commission on Occupational Education Institutions
Southern Association of Colleges and Schools
795 Peachtree St., N.E. Atlanta, GA 30365
1-800-248-7701 contact: Brenda Hadaway

Brochures and order forms for curriculum guides, catalogs of performance objectives and performance guides, etc, may be obtained through the Curriculum Publications Clearinghouse, Western Illinois University, Horabin Hall 46, Macomb, IL 61455. The writer obtained a brochure and order form from the NWCCC (see above). The reader should be aware that materials produced by VTECS may not appear in the ERIC database, since VTECS itself offers these products for sale.

The following is quoted from the introduction to the VTECS publication A Catalog of Performance Objectives, Tool and Equipment Lists, and Performance Guides for Machinists, (1982), a 234-page document. This work was obtained by the author on 30-day loan from NWCCC.

The Vocational-Technical Consortium of States (V-TECS) is a cooperative venture of fourteen states and three agencies for the purpose of developing objectives and performance guides in occupational education through the sharing of resources and technology . . .

All products are developed within the member states using a uniform procedure and format in order to insure confidence

in the products and promote transportability between the states. The major components of the procedure are: (1) review of relevant literature, (2) development of task listings by a domain of job titles, (3) comprehensive interview of job incumbents for the purpose of further development, refinement, and validation of the task listing, (4) selection of a representative random sampling of incumbent workers from the population of workers within the state which is developing the catalog, (5) administration of the occupational inventory to the sample of incumbent workers, (6) computer analysis of data collected from the sample of workers, (7) conversion of job-relevant task statements into performance objectives, listing tools and equipment, and writing performance guides, (8) comprehensive field review of the catalog, (9) analysis of the data from the field review, (10) revision of items in the catalog identified during the field review as being faulty, and (11) preparation of the final catalog. (V-VI)

Task analysis being an important constituent of a systems approach to curriculum design, this introduction has been quoted at length because it represents one widespread strategy for determining curriculum content in competency-based vocational education. V-TECS now includes 26 states.

One would imagine an important first step in acquiring curriculum development materials would be to obtain current bibliographies of the subject. Unfortunately, no really up-to-date bibliographies dealing with machine tool technology are available at this time. Extant bibliographies include:

Industrial Materials and Processes: A Vocational Instructional Materials Development System Bibliography. Available via NWCCC. This bibliography is dated to the point of being unusable.

The various curriculum coordination centers may access each other's materials and share the VECM database. The following 140 page bibliography dealing exclusively with machine tool instruction may be obtained by contacting the Southeast Curriculum Coordination Center

Resource Guide for Performance-Based Machine Shop Instruction. Department of Industrial Education, University of Maryland, College Park, MD. 1977.

An important, if dated, work, the content includes the following: Definition of performance-based instructional program; task analysis; performance objectives; criterion-referenced measurement; using an instructional systems approach; occupational information; curriculum resources; etc. The body of the work lists commercial and non-commercial

resources related to machine shop and vocational education. Some entries listed are no longer available or are hard to obtain. Many addresses are no longer valid.

Each state has some form of vocational-technical division which may loan or sell curriculum development materials. Some will have a machine-readable database to facilitate locating these materials. In California:

Vocational and Occupational Information Center For Educators
560 "J" Street, Suite 385
Sacramento, CA 95814
916-445-0401

Materials may be loaned from VOICE for a period of three weeks and may be renewed by phone.

A search was conducted by the author on 11 Aug. 1989, using "machinist" and "machine tool technology" as descriptors. Within one week a computer printout was received containing 63 entries. Broken down by subject area these are as follows:

3 entries: related to the physically handicapped

10 entries: related to VESL (vocational English as a second language)

18 entries: unrelated to machine tool technology instruction.

4 entries: reviews of machine shop textbooks (for the most part outdated).

All the relevant VOICE holdings are listed in the bibliography of non-commercial curriculum resources in chapter 9.

Hardware

Tools for Schools
Defense Industrial Plant Equipment Center
Attn. Mr. Theodore Page,
Defense Industrial Reserve Loan Branch
Memphis, Tennessee 38114
901-775-6593

"Tools for Schools" is a program established in 1955 whereby the Department of Defense loans equipment (typically machine tools) no longer used, to schools, including institutions of higher education. The renewable loan period is for 5 years. This program is very much alive; at the present

time over 40 million dollars worth of equipment is on loan.
In California 285 items are on loan, worth over \$1,700,000.
Write the above address to obtain a brochure explaining how
to apply for equipment. Indexed: ERIC ED224970

CHAPTER 9. A Selected Machine Tool Technology Non-Commercial Curriculum Resources Bibliography

Entries below have been obtained by searches of the ERIC and VECM databases (the ERIC search was for materials published from 1980 to the present), from the holdings of the Northwest Curriculum Coordination Center, and from catalog listings of the various divisions of technical/vocational/industrial education and curriculum development/dissemination centers within the state departments of education throughout the United States.

Compiling the items listed below presents some interesting bibliographic problems; an entry may no longer be available in the state where it was produced, but may sometimes be available - under a different indexing system - in the libraries of several other states. Title similarities make cross-referencing difficult, hence there will be minor duplication of entries. All entries below are listed under the state where they may be procured. If an entry has been published in a state other than where it is located, I have listed the abbreviations of the producing state. Each entry is accompanied by either a database number or an complete address where the material may be currently obtained. A few significant entries are at the high school education level, while the remainder are post-secondary level.

Entries with ED numbers are available via ERIC (see above)

Entries with VOICE (Vocational and Occupational Information Center for Educators) numbers may be obtained by contacting:

VOICE

560 "J" Street, Suite 385, Sacramento, California 95814
(916) 445-0401

Entries with VECM numbers may be obtained by contacting any Curriculum Coordination Center (see above)

Entries with NWCCC (Northwest Curriculum Coordination Center) numbers may be obtained by contacting:

NWCCC

Old Main Bldg., Fourth Floor

Saint Martin's College

Lacey, WA 98503

All other catalog numbers (appearing before the title) are order numbers for the particular institution at which the work is located.

Air Force

Apprentice Machinist. Vols. 1-4 1981 491 pp. Instructional Materials. A correspondence course. ED265360 VECM 006261

Machinist. 1983 584 pp. Instructional Materials. A correspondence course. ED265356 VECM 006262

Alabama

STEP Training Program for Machinist. 1985 303 pp.

A curriculum guide. STEP: Skills Training and Education Program. VECM 005640 Available from South-East Curriculum Coordination Center.

Arizona

Arizona Center for Voc. Ed., PO Box 6025, Northern

Arizona University, Flagstaff, AZ 86011

Machinist. 1987 Teaching Guide. 222 pp. ED287035
VECM 007291 Includes bibliography

California

Development of Curriculum for a Nontraditional Machine Tool Technology Program; Accessible to the Physically Handicapped. 90 pp. Indexed in VOICE as p-01-08-439.

Techsign Project. 38 videocassettes to teach tech. sign language to voc. ed. teachers and students. 1972
Indexed in VOICE as P-19-00-754-AV. ED247375 CE038866.

Techsign Project 1981 NWCCC CA10222SN

VESL: Machine Technology. 43 pp. Indexed in VOICE as 7559.

VESL for Machine Shop. 1986. 195 pp. Indexed in VOICE as 09465.

(California?) Rock Valley College Indochinese Training Program. Indexed in VOICE as 09522.

(California?) English for Special Purposes-Machine Shop. Indexed in VOICE as 09527.

VESL Language Competencies 1984 Uses machine shop to demonstrate VESL competencies. VECM AN006388 Available from WCCC.

General Machinists Course Outline. 1986 207 pp. ED277820 CE045747. Designed for use in program combining VESL and bilingual voc. ed. VECM 007025 Available from Midwest Curriculum Coordination Center.

Production Machine Shop Employment Competencies

Part 1: Practices and Principles ED255710 CE041202 VECM 006389

Part 2: Saws, Drills, Grinders ED255711 CE041203

Part 3: The Engine Lathe ED255712 CE041204

Part 4: The Milling Machine ED255713 CE041205 1984, 47 to 127 pp. Teaching guides.

Learning to Verbally & Visually Communicate The Metalworking Way. 1983 48 pp. A curriculum Guide. for educationally disadvantaged industrial education students. ED244099 Also, Learning to Read and Write the Metalworking Way ED244097

Colorado

Occupational Analysis: Machine Shop. 1979 12 pp. Indexed in VOICE as 08742.

Connecticut

Machine Tool Blueprint Reading Outline 1981
NWCCC CT810146MT

Industrial Arts Curriculum Guide for Automated Machining in Metals Technology. 1985 61 pp. A teaching Guide. ED263390 CE042908

Apprentice Machine Theory Outline. 1982 66 pp. A teaching guide. Designed for machine tool apprentices. ED251671

Florida

Program Guide for Basic Precision Machining and Precision Machining. 1985 152 pp. (U. of South Florida, Tampa, Dept. of Adult and Voc. Ed.) contains curriculum frameworks, student performance standards, and test questions. Indexed in VOICE as 09209. ED268270 VECM AN007339

Machine Shop Student Learning Guide. 1984 155pp. ED255754 Instructional Materials.

Department of Education, Bureau of Career Development,
Program Services Section, Florida Education Center,
Tallahassee, FL 32399

Metal Working Processes, Vols. I and II
Includes instructional modules, bibliography, and
general information about Industrial Arts course
activities.

A Catalog of Performance Objectives and Performance
Guides for CNC Operator 1986 113 pp. VECM 006458
Available from Southeast Curriculum Coord. Center

Georgia

Machine Shop/Machine Tool Operator (test item bank) 1984
NWCCC GA840776TI

Machine Shop Projects. Instructor's Guide. General
Information. 1980 794 pp. 101 projects for use in machine
shop courses. ED197124 CE027733

The University of Georgia, College of Education,
Division of Voc. Ed., Vocational Education Materials
Center, Green Street, Athens, Georgia 30602

Curriculum Guide:

Machine Shop a post-secondary curriculum guide
Specifies course objectives, learning units, learning
objectives, evaluation procedures.

Program Standards:

Machine Tool Technology 1988. VECM AN008076 develo-
ped for post-secondary ed., and includes guidelines
by which institutions and programs will operate.
Also, Advanced Machine Tool Technology 1988. VECM
AN008059. These items are available on disk for IBM
or Apple. Also, Automated Manufacturing.

Hawaii

Western Curriculum Coordination Center: A Microfitch
Catalog of WCCC's holdings. 1984 indexed in VOICE as
07601.

Idaho

Curriculum Dissemination Center, Vocational Teacher
Education, University of Idaho, Moscow, ID 83843
Vo-Ed 136 Precision Machining Technology A curriculum
Guide and task listing. A new revision of this work
will be available Spring 1990.

Illinois

Curriculum Publications Clearinghouse, Western Illinois
University, Horrabin Hall 46 Macomb, IL 61455

Education For Employment Task Analyses: Machinist

Education For Technology Employment: CAM (Computer Automated Manufacturing) 1987

Machine Shop Fundamentals for Limited English Proficiency Students: Machine Shop Fundamentals

Workbooks available for the following in English, Spanish, Vietnamese, and Laotian:

Machine Shop Fundamentals, Part I 1982 Workbook Available

Machine Shop Fundamentals, Part II Workbook Available

Note: Some of the materials listed above may be duplicated below

Bi-Lingual Access Program: Developmental Materials for Non-Native Students: Machine Tool Operations. Also written in Spanish. Indexed in VOICE as 02304

Multi-Cultural Competency-Based Vocational Curricula: Machine Trades. 1981 30 pp. Indexed in VOICE as 05451. ED205787 VECM 000181 Includes a 79-frame slide presentation with 13-minute audiotape in English, Spanish and Thai

Vocational English as a Second Language for Machine Tool Operations. 1981. indexed in VOICE as 06896.

Machinist. 1982. C.B. performance objectives relating to employment as machinist. Indexed in VOICE as 08496.

Machine Tool Operator. 1983. Same as above. VOICE 08497.

Machine Tool English. 1980 52 pp. VOICE 09588

Machine Tool Operator - VESL. 1981 193 pp. VOICE 02426.

CNC Curriculum Guide. 1986 328 pp. ED274787

CNC Test Item Blank. 1986. 67pp. 285 test items for use with above curriculum guide. ED274788

A Catalog of Performance Objectives, Performance Conditions and Performance Guides for Machine Tool Operations. 1983 325 pp. ED235377 CE037295.

Machine Trades Technical Terms. English-Thai Lexicon. 1982 36 pp. ED223846 CE034384

Iowa

Machine Trades. A Competency-based Articulated Curriculum.
1982 164 pp. A teaching guide providing articulation
between secondary and post-secondary levels.
ED250467 CE039896

Kentucky

University of Kentucky, Office of Instructional Resources,
Audio Visual Services, 102 Scott Street Building,
Lexington, Kentucky 40506-0002

Basic Machines-Lathe 15min. 1945 Available for rent.

A Catalog of Performance objectives, Tool and Equipment
Lists, and Performance Guides for Machinists. (V-TECS)
1982 NWCC: KY820222MT VECM 003548

Drilling Machines: Vocational Machine Shop. 1974 71 pp.
ED098398 CE002502

Curriculum Development Unit, Office of Voc. Ed.,
2024 Capitol Plaza Tower, Frankfort, KY 40601

Machinist. 1981 1258pp. Competency-Based; Task
Analysis; Criterion Referenced Evaluation. 90 modules,
instructor's manual, 43 slide-tape presentations. VECM
007164

Louisville University, Dept. of Occupational and Career
Education

Exit Math Competencies For Selected Industrial
Education Post-Secondary Programs in Kentucky
(Drafting, Electricity, Electronics, Machine Shop)
ED288025

Maryland

Maryland Vocational Curriculum Research and Development
Center, Department of Industrial, Technological, and
Occupational Education, J.M. Patterson Bldg., University
of Maryland, College Park, Maryland 20742

Apprenticeship Information Handbook, Volume I,
Machinist/Metal Trades 1982 172 pp.

Machine Shop Frederick Co. 1985, 94 pp. Special
Needs. (handicapped)

Resource Guide for Performance-Based Machine Shop
Instruction. 1977 140 pp. A bibliography of commercial and
non-commercial materials. Has not been updated. Available
from Southeast Curriculum Coordination Center

Handbook on Numerically Controlled Operational Devices.
1980 65 pp. Descriptive introductory information.
ED188895

Michigan

Michigan Career Education and Vocational Education
Resource Center, 133 Erickson Hall, Michigan State Univer-
sity East, Lansing Michigan 49924-1034

Machine Tool Operation 1986 282 pp. A curriculum
guide developed by the Michigan Department of Correc-
tions.

MI-TI-15 Machine Trades 392 pp. 1984 Tasks, evalua-
tion, criteria, tools and equipment.

Industrial Occupations: Machine Tool Operator 7 pp.
an "Education for Employment Task List"

Industrial Occupations: Machinist 13 pp. A task list.

Teacher Occupational Competency Test: Tool and Die Making
Examination. 1987 A written and performance test.
NWCCC 007801

Machine Trades Curriculum Guide 362 pp. 1983 Includes
Intro. Safety, Course Components, Job Info., Task List,
Equipment list, Special Needs Info. Evaluation.
Available From WCCC: 621.907 MI 1983

Machine Shop, Definitions: Hmong, Lao, Vietnamese 1985
VECM AN007050 Available from all CCC's.

Minnesota

Minnesota Curriculum Services Center
3554 White Bear Ave. White Bear Lake, MN 55110
Competency-Based Education

C830 Machine Shop Task List

C831 Machine Shop Terminal Performance Objectives

C832 Machine Shop Competency Record

Mississippi

Mississippi State U., Research and Curriculum Coordinating
Unit:

Vocational Metal Trades-Basic Plan for the Organization
and Management of Instruction 1967, 62 pp. A course
plan. Also, Vocational Tool and Die Making. 1967 29 pp.

Missouri

University of Missouri-Columbia Instructional Materials
Lab. 2316 Industrial Drive Columbia, Missouri 65202

Machine Shop cross-referenced to the Missouri competency profile. Includes student worksheets, instructor's guide, handouts, objectives. Areas include CNC, math, precision measurement, blueprint reading, etc.

Micrometers, Calipers and Gages Explanation, use of measuring devices: wire gages, thickness gages, verniers.

Statistical Process Control emphasis on analyzing data which has been summarized through statistical tools.

Geometric Dimensioning and Tolerancing An introductory training module

Machinist includes occupational outlook, safety, tools and equipment, operations, NC programming.
Machine Shop Profile A competency profile used for documenting student progress.

New Hampshire

Machine Operator Training Program and Curriculum
1984 48 pp. A teaching Guide for an 11-week course.
ED250507 CE040019

New Jersey

Machine Shop Operation -1 1972 NWCCC NJ720018MT
Machine Shop Operation -2 1972 NWCCC NJ720018MT
Machine Shop Operations -2 1977 NWCCC NJ770110MT

The following 3 entries are available from Northeast Curriculum Coordination Center; they are no longer available in New Jersey.

Call No.: 15.0702 NJ 63 HR MS 56; 57
Precision Inspection Manual 2 Vols. 470 pp. 1963
subjects range from steel scale to optical flats.
An answer book for the manual is available.

Occupational Preparation - Inspection and Quality Control
Student's Manual 130 pp. 197?
Instructor's Guide 127 pp. 197?

CD 234 Electrical Discharge Machining 65 pp. 1973
An introduction to the process. 7 lessons.

New York

New York State Dept. of Education, Bureau of Agriculture, Trade and Technical Programs. One Commerce Plaza. Room 1621, 1 Commerce Plaza, Albany, New York 12234

Contact: Bob LaCase 518-474-4802

As part of the New York Trade and Industrial Education Curriculum Product, Teaching for Occupational Proficiency (TOP), 119 teaching modules consisting of topic headings, teaching time, skills, knowledge, and outcomes are available which deal with precision metal work occupations. About 40 of these are related to material removal processes. The modules are available on 3 1/2" or 5 1/4" diskettes. Modules include:

Module No.	Title	Module No.	Title
15	Blueprint Reading	16	Orthographic Projection
17	Geometric Construction	18	Auxiliary Views
19	Sectional Views	20	Dimensioning Procedures
21	Assembly Drawing	22	Intro to CAD
25	Metallurgy	27	Robotics
30	Bench Work	66	Precis. Meas. and Layout
67	Vert. Power Saws	68	Horiz. Power Saws
69	Drill Press	70	Drill Press
71	Lathe, Setup	72	Lathe, Workholding
73	Lathe, Tools, Holders	74	Lathe, O.D. Op's.
75	Lathe, O.D. Forming	76	Lathe, I.D. Op's.
77	Milling Mach. Setup	78	Mill, Cutting Tools
79	Vert. Mill	80	Horiz. Mill
81	Grinding Process	82	Surface Grinding
83	Pedestal Grinding	84	Tool @ Cutter Grinding
85	Cylindrical Grinding	86	Centerless Grinder
87	Heat Treatment	88	EDM @ Special Processes
89	Shaper @ Planer	90	N.C. Control Format
91	N.C. Turning Centers	92	N.C. Machining Centers

For more information write to the above address and request the 16-pp. TOP information handbook and the precision metalwork occupations matrix of modules and instructional programs.

North Carolina

North Carolina Dept. of Public Instruction, 116 West Edenton Street, Education Bldg. Raleigh, NC 27603-1712
Metals Manufacturing Goals and Objectives. 13 pp. 1989

North Dakota

CNC: Instructional Manual. The North Dakota High-Technology Mobile Laboratory Unit. 1985 132 pp. A teaching guide. ED262267 CE042703

Ohio

Instructional Materials Lab, The Ohio State University, 842 W. Goodale Blvd. Columbus, Ohio 43212

MJJS Machine Trades Jobs and Job Plan Sheets

LMGT-MT Machine Trades Lab Management Guide 1990

TA-006 Machine Trades Task Analysis 1990

MTLM-1 Machine Trades 1 - Learner's Manual

MTLM-2 Machine Trades 2 - Learner's Manual

MTIM-2 Machine Trades 2 - Instructor's Manual

Oklahoma

Oklahoma State Department of Voc. and Tech. Ed.

1500 West Seventh Ave. Stillwater, Oklahoma 74074-4364

Machine Shop I. 1982 898 pp. 43 transparencies
43 job sheets, 47 assignment sheets.

Machine Shop I corresponding Learning Activity
Packets (LAPS). include:

Section A- Orientation. Includes 58 slides.
ED279816

Section B- 1982 Basic and Related Technology.
Includes 16 shows, 507 slides, 16 audiotapes/
script. ED 279817 VECM 001581

Section C-Hand and Bench Work. 11 shows/ 212
slides, 11 audiotapes ED 279818

Section D-Power Saws and Drilling Machines.
Includes 21 shows, 235 slides/8 audiotapes
ED279 819

Machine Shop Lathes 1982 475 pp. 36 job sheets, 21
transparencies, a complete training program
see ED230764

Corresponding LAPS include:

Unit I - appears to be mislabeled in catalog,
as it refers to shapers.

Unit II - Intro. to Lathes 3 shows/ 189 slides/6
audiotapes

Unit III - Engine Lathe Operation 13 shows/ 788
slides/20 audiotapes

Unit IV - Turret Lathe Operation 3 shows/ 147
slides/3 audiotapes

Machine Shop: Milling Machines 1983 353 pp. 18
transparencies, 26 job sheets.

Corresponding LAPS include:

Unit I - Introduction to Milling Machines 2
shows/slides/2 audiotapes ED 279804

Unit II - Horizontal Mills 10 shows/slides /12
audiotapes ED279805

Unit III - Vertical Mills 11 shows/slides/12
audiotapes ED279806
Machine Shop: Grinding Machines 1983 340 pp. 14
transparencies, 22 job sheets

Corresponding LAPS include:
Unit I - Intro. To Grinding Machines 171
slides/5 audiotapes ED279801
Unit 2 - Surface Grinding 488 slides/10
audiotapes ED279802
Unit 3 - Cylindrical Grinding 235 slides/7
audio tapes ED279803

CNC Turning Technician 1984 428 pp. 2 transparencies,
15 job sheets ED259172

Oregon

Oregon State Department of Education:

Catalog of Individualized Learning Materials. 44 pp.
module titles including machine tools. Indexed in VOICE
as 04600.

Machine Tool Safety Part II 1982
Cassette: NWCCC OR820198MT Filmstrip NWCCC OR820199M

Mathematics in Vocational Education 107 pp. 1982
available from WCCC 510 L 1982 C.2

Rhode Island

Department of Education, Bureau of Vocational-Technical
Education, 22 Hayes Street, Providence, R.I. 02908
Machine Technology 176 pp. A competency-based curriculum
guide.

South Carolina

South Dakota Vocational Curriculum Center, 205 West
Dakota, Pierre, SD 57501

Some of the following entries may be produced by other
states and may be duplicated in this bibliography. The
center's catalog numbers are included.

TJ 1125.c372 Machinist: Catalog of Performance
Objectives and Guides

TJ 1125.D86 M323 81 Machine Shop I 1981 Introductory
Curriculum

TJ 1125.I32 P76 Program Standards for Machining
Technology 1984 Produced by the Idaho Vocational
Programs Standards Project.

TJ 1125.G73 1985 Machine Shop Curriculum Guide 1985
Development of a V-TECS guide by South Carolina machine
shop instructors. VECM AN006612

TJ 1185.G74 1983 Machinist 1983 an instructor's guide
for individualized study

TJ 1218.D86 1983 Machine Shop Lathes 1983 39 job
sheets on shaper and lathe operations.

TJ 1225.D86 1983 Milling Machines 1983 an instruc-
tor's guide.

TJ 1293.D86 M32 1983 Grinding Machines 1983 an
instructor's guide.

TJ 1185.M32 Machine Tool Resources n.d. A collection
of resources covering various aspects of machining.

Articulated, Performance-Based Instruction Objectives
Guide for Machine Shop Technology. 1984 771 pp.
ED251646 VECM 004652 Ed. Level: 11-12; 13-14

Tennessee

An Introduction to Numerical Control. Problems for NC
Part Programming. 1985 106 pp. A text and workbook.
ED256875

ED267220 Machine Shop: Scope and Sequence 1984. 19 pp.
Tennessee State Dept. of Ed. A teaching guide.

Texas

Texas A&M University, Instructional Materials Service
F.E. Box 2588, College Station, TX 77843-2588

Competency Profile - Machinist. 1985 4 pp. A list of
trade competencies for machinist. VECM 005891.

The following materials are part of the Manufacturing
Cluster Program, designed for students in grades 10-12.
The materials are also appropriate for community education
classes. The entries below do not comprise a complete list
of available resources from Texas A&M University.

Block I -- Machine Shop Orientation an introduction to
machine shop practices.

Block II -- Print Reading line conventions, dimensioning,
basic views and representations.

Block XII -- New Machining Technology Provides basics for NC and non-traditional machining techniques.

Print Reading for the Machine Shop pre-test, reading assignments. Referenced to entry above.

Machine Shop Basic Course Outline. 1975. Presented by major blocks in logical teaching sequence

Machine Shop Orientation Transparencies: 42; color
1981 VECM 005910

Print Reading Transparencies: 46; color

Lathe Transparencies: 81; color

Shaper Transparencies: Color

Milling Machine Transparencies: 89; color

Grinding Transparencies: 69; color

New Machining Technology Transparencies: 35; color

University of Texas at Austin: Instructional Materials
Services: Extension Instruction and Materials Center
P.O. Box 7218, Austin, TX 78713-7218

Hand Tools for the Metalworking Trades 1972.

Computer Numerical Control 1986 A computer simulation of CNC lathe operations, including student's manual, instructor's guide, and one disk. Available for Apple II or IBM.

Machinist Study Guide. 1971. A student study guide including 71 assignments based on reference books available elsewhere.

Machinist. 1982 139 pp. A teaching guide, with 68 assignments, including safety, operations, NC programming, owning a business, etc. VECM 004763

East Texas State University, Occupational Curriculum
Lab, Commerce, TX

General Metal Trades:

Milling Machine Operator. Coordinator's Guide.
1983. 88 pp. A guide for students enrolled in co-op training. VOICE 08659. ED240372

Lathe Operator Coordinator's Guide. 1983 93 pp.
Indexed in Voice as 08661. ED240371

Drill Press Operator. Coordinator's Guide. 1983
56 pp. ED240370

Computer-Numerical Control and the EMCO Compact 5
Lathe. 1988. Instructional Material. ED300589

Vermont

Vermont Department of Education: Trades and Industrial Ed.
Montpelier, VT 05602-2703

Machine Trades Curriculum Guide 1985

Virginia

Virginia Vocational Curriculum Center, 2200 Mountain Road,
Glenn Allen, VA 23060-2208

TI765.001 Machine Shop Instructional Resource Guide.
1984 646 pp. A curriculum guide. Instructional
framework for courses designed for entry into
machinist-related occupations. VECM 003773.

8-830.012 Machine Shop Task Analyses 1983, revised
1985. Secondary and Postsecondary courses in machin-
ist-related occupations.

TI765.017 Machine Shop: Curriculum Standards and the
Companion Document AL. 1982

TI765.013 Curriculum Outline for Machine Shop 1979

TI765.019 Machine Trades Curriculum Guide MI 1984

TI765.022 Manufacturing Cluster: Occupational
Preparation - Inspection and Quality Control (Student
Manual) 1975 NJ TI765.024 - Instructor's Guide

TI765.024 Machine Shop Vocational Training Modular
Instruction (VOL.I) -- Federal Reformatory, Peters-
burg, VA 1970 TI765.025 - VOL II.

TI765.036 Vocational Machine Shop 1981 MO (Instruc-
tor's guide sections A-B-C).

TI765.038 Army Correspondence Course Program: Machine
Shop Practices. 1977 MD.

BS120.015 Practical Problems in Mathematics for
Machinists. 1973 NY.

Washington

Machinist Apprentice Related Training 1975 NWCCC
WA750591TI

Proposal for Mobile Machinist Unit-Mobile Technology Classroom 1982 NWCCC WA820119MT

Mathematics Notebooks - Tool and Machine Design 1977 NWCCC WA770144SN

West Virginia

West Virginia Vocational Curriculum Laboratory
Cedar Lakes Conference Center, Ripley, WV 25271

Machine Shop 1980 757pp. Includes units on shop facilities, presses, power saws, grinding machines, etc. Fifteen units.

Machine Shop 1987 127 pp. A competency-based curriculum guide. Not a complete self-contained program. Nine units.

Metal Trades Combined 1987 66 pp. Nine units, including blueprint reading; hand tool and bench work; MIG, TIG, and acetylene welding; lathes, mills, sawing and drilling ED 279878

Industrial Equipment Maintenance 1987 95pp. Includes hydraulic/pneumatic systems, machine tool operations, crane elevators, plumbing, maintaining equipment. ED 279875

Machine Shop. Voc. Ed. Curriculum Guide. Ind. and Tech. Ed. 1987 141 pp. ED279879

Using Microcomputers in Voc. Ed. to Teach Needed Skills in Machine Shop and Related Occupations Final Report. 1984 19pp. ED269597

Competency-Based Education Curriculum for Machine Shop-Teacher's Guide 1980 214 pp. ED201862 Related Student material: 593 pp.

Wisconsin

Milwaukee Area Technical College, 700 W. State St.
Milwaukee, WI 53233

MATC has published a number of CNC instruction manuals which are available as a single complementary copy, or in quantity for a fee. Contact: John Stilp.

CNC Vertical Machining Center Operations 1989 417 pp. 25 projects, for Fanuk control. Available with video tape.

CNC Turning Center Operations 1989, 527 pp. 25 projects. For Fanuk control. Available with video

CNC Manual Programming Mill I 1989, 168 pp. 14 programming projects. Includes fundamentals of conventional/manual CNC programming of four axes horiz. mach. center with Fanuc control.

CNC Advanced Manual Programming Mill II 1988, 97 pp. 12 advanced programming projects.

CNC Graphics Programming - Mill 1988 173 pp. 7 projects. For 4 axes horiz. mach. center equipped with Conversational Automatic Programming (CAP) System Option installed on Fanuc 10,11/12MF controllers.

CNC Horizontal Machining Center Operations 1988 120+ pp. for four axes mach. center with Fanuc controls.

CNC Horizontal Machining Center Operations and Prove Out 1989 This volume completes the instruction of the work listed above.

The following CNC Operations and Programming Manuals will be available by Oct. 1990.

CNC Manual Programming Turn I Fundamentals of conventional/manual programming for 2 axes turning center with Fanuc controller.

Advanced Manual Programming Turn II Advanced instruction of 2 Axes turning center with Fanuc Controller.

CNC Graphics Programming for turning center equipped with FAPT System Option installed on Fanuc 10,11/12 controllers.

CNC Turning Center Operations Advanced setup and operation of two axes turning center with Fanuc controls.

CNC Turning Center Operations and Prove Out This manual completes the instruction of the work listed above.

MATC Machine Shop '84: Specific Skill Needs Assessment for Machine Shops in the Milwaukee Area. 1984 69 pp. A research report. ED245778 JC840400.

Vocational Studies Center, 1025 W. Johnson St., 964 Educational Science Bldg., Madison, Wisconsin 53706

Tools, Equipment, and Machinery Adapted for the Vocational Education and Employment of Handicapped People. 1981 756 pp. A Directory of equipment available.

Western Wisconsin Technical Institute, LaCrosse, WI

Pre-Vocational Machine Tool Study Guide. 1984 A Bilingual vocational materials training project. VECM AN 007089 Available from all CCC's.

V-TECS, 795 Peachtree St. N.E., Atlanta, GA 30365
800-248-7701

V-TECS Guide for Machine Shop. 1985 443 pp. A Teaching Guide. ED264397 CE043059

A Catalog of Performance Objectives, Tool and Equipment Lists, and Performance Guides for Machinists. 1982 234 pp. V-32 NWCCC 003548

Computerized Numerical Control. 1985 144 pp. A complete validated worker task list. VECM 005356

ED274787 CE045123 Computerized Numerical Control Curriculum Guide 1986. 328 pp.

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